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ABSTRACT

This document deals with the concept of productivity within the university community. The principal findings is that productivity in its usual formulation (the ratio of output to input) is becoming less useful and less meaningful as an indicator of university performance. Such a condition has come about because the university in America and elsewhere is moving rapidly from a production mode to a planning mode. In the production mode the main idea is to construct a stable machine that will produce what is desired. To improve the machine one compares output with input then changes parts or components as judgment, after the fact, dictates. The planning mode forces the consideration of most of the elements of production in advance. Not only are they considered, but they are implemented in planning rather than post facto. (Author/HS)

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Productivity and the Academy: The Current Condition

William Toombs

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Center for the Study of Higher Education The Pennsylvania State University
Report No. 16

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Preface

"Productivity" is a bright banner of the day. This paper looks at its workings in a corner of the vineyard where the vines are tough, the grapes tender, and the fermentation often heady -- the university.

The principal finding is that productivity in its usual formulation, the ratio of output to input, is becoming less and less useful, less and less meaningful as an indicator of university performance. The generalization holds no matter which techniques might be used for measurement. Such a condition has come about because the university in America and elsewhere is moving rapidly from what might be called a "production mode" into a "planning mode." In the production mode the main idea is to construct a stable machine that will "produce" what is desired. To improve the machine one compares output with input then changes parts or components as judgment, *after the fact*, dictates.

The planning mode, as represented by PPBS (program planning and budgeting systems), twenty-year horizons, alternate futures, or other vehicles, forces the consideration of most of the elements of production *in advance*. Not only are they considered, but they are manipulated *in plan* rather than post facto. Student-faculty ratios, cost per credit hour, and a host of other

familiar indexes become the tools of planning rather than the instruments of judgment. Effectiveness is now represented by the degree to which the university achieves its own goals. It goes without saying that these goals are set in response to the institution's mission in society.

The reasons for this conclusion are derived from this paper's rather detailed criticism of the production idea in its output-input form. The idea itself has notable constraints, but when applied to education its limitations are increased by the essential characteristics of the teaching-learning process. Techniques developed for assessing output and input are numerous but provide very restricted information often intended for uses quite different from the current ones. A brief summary is made of the techniques which are beginning to appear in the planning mode.

Does the general conclusion cited above mean that techniques that have been developed to measure processes in education are useless? Not at all. The credit-hour ratios, faculty workload data, and distribution of research funds still have high utility for internal analysis and as instruments of planning. Does this suggest that costs per student, student-faculty ratios and similar simplified measures will disappear from the judgments of legislators, public critics, and sensitive taxpayers? Probably not,

but the more rapidly institutions of higher education are able to move into the planning configuration, the less troublesome these dangerous simplisms will appear. The really essential task for the university does not lie in convincing the public by some sleight of hand ratio that its instruction is "efficient" or cheap but in conveying the full scope of university activity -- its research, its public service, and its instruction -- to a variety of new publics.

Introduction

Higher education in its essential nature is a process of "converting tangible resources into intangible resources."[1] This is a truism that no amount of manipulation can alter. Other segments of the economy that are characterized by professional and institutional activity -- notably the human service occupations, institutionalized in the form of hospitals, public agencies, libraries, etc. -- share this attribute, although to a lesser degree. But truisms are often hard to live with. From time to time those involved in the educational process along with external observers have found the need to specify the process in terms more readily understood and thought to be more accurate.

Since we live in an age when Lord Kelvin's dictum, "measure it," has yielded high results in the world of science, a number of attempts have been made to assess in quantitative terms the outcomes of applying those "tangible resources" to education. In areas like psychological testing, attitude assessment, and broad gauge surveys of practices, the movement toward measurement

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[1]Algo D. Henderson, "Some Unresolved Problems," Remarks delivered on the occasion of his citation by the Higher Education Colloquium, March 17, 1971.

has enjoyed substantial yet qualified success. The belief that very similar results can be discovered or invented in the form of numerical indicators of activity for a whole university is one of the more persistent ideas in higher education.

This paper examines some of the ways in which that idea has been applied. In the first paragraphs that follow, the pattern of development is a simple one which falls into an analysis suggested by John Dewey who proposed that inquiry begins when traditional beliefs are doubted.[2] One begins by looking at the inadequacies and uncertainties of tradition until the problem is defined. The general plan here is to begin with the simplest and most traditional model, the "common sense" view of the production process, drawn from neoclassical economics and the physical sciences. This simplified idea still has a great deal of utility, but for our purposes it becomes the central point around which other considerations can be arranged. A second section treats the shortcomings in the model which arise from the design itself and from the assumptions which attend it. The third section looks at the various techniques that have been developed to apply the output-input idea to colleges and universities. Next, a summary of some of

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[2]John Dewey, *Logic: The Theory of Inquiry* (New York: Henry Holt and Co., 1938).

the alternate models that have appeared is offered. Finally, from this multi-faceted examination a set of general conclusions is developed. These are not viewed as a set of definitive answers but rather as an heuristic, a beginning for further inquiry into the very durable question of how productivity may be demonstrated by the university.

The commonest schemes by which the events of education can be quantified cluster around the concept of production or "productivity." There is not much confusion about the theoretical definition of the term, for its meaning may be apprehended by simple logic or by intuition: elements are combined or acted upon to yield new elements that are changed in either form or quantity. The relationship between them is taken to be productivity. The difficulties arise when one sets about operationalizing the concept. Constructing indices by which the underlying variable may be measured is almost the whole of the task, an activity not uncommon in the social sciences.[3] The general question is "How can the productivity of educational institutions, particularly those in higher education, be assessed?"

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[3]Hubert H. Blalock, Jr., *Social Statistics* (New York: McGraw-Hill Book Co., 1960), Ch. 2, and F.S.C. Northrop, *The Logic of the Sciences and the Humanities* (New York, MacMillan, 1947), Ch. 2.

The notion of productivity was not developed in an orderly way under the conceptual umbrella of any single discipline. What began in economics was applied to the problems at hand by the simple expedient of twisting it to fit. As a consequence there is no coherent literature that can be readily isolated and examined. As a guide to the discussion in the following pages on productivity in higher education it will be helpful to have a framework of assumptions: higher education begins with a set of resources, some pecuniary and others less measureable. These RESOURCES are converted into forms that are applicable to the process of education, PROCESS ELEMENTS. They are further organized into a certain structure or FORMAT. The process yields a set of benefits which represent the goals society expects to have served and embodied in the student, the state of knowledge, and the public weal. (See Figure 1.) If we were able to construct our ideal measure of productivity for this process, it would simply relate units of the first stage to those of the last: dollars of inputs to increased student competence or to units of knowledge or of public benefit. While this simple relationship is immediately seen as impossible, it does display an ultimate ideal. One way of testing each of the methods and devices that follow is by evaluating how much of this idealized process each comprehends.

The idea of measuring productivity has had a long history, but the tide of interest has flowed and ebbed. The origins of the interest have differed, and the purposes to be served by indicators have varied. After a period of lukewarm interest in the early and middle sixties, we can now see a resurgence of concern about demonstrated productivity that focuses, not only on the university at large and its faculty, but also on its component colleges and institutes.[4]

Two other ideas lie close to productivity, unit costs on the one side and accountability on the other. These will, however, be omitted from this specialized discussion except as they appear in illustrative material. By now, too, the notion of productivity has been applied to education in a variety of forms each with numerous overtones. Three main strains have emerged. One of these considers the <u>productivity of a whole educational system</u> in terms of its effects upon a national economy. This macro-economic approach is relatively new with perhaps twenty years of history, and it has been useful in analyzing the needs

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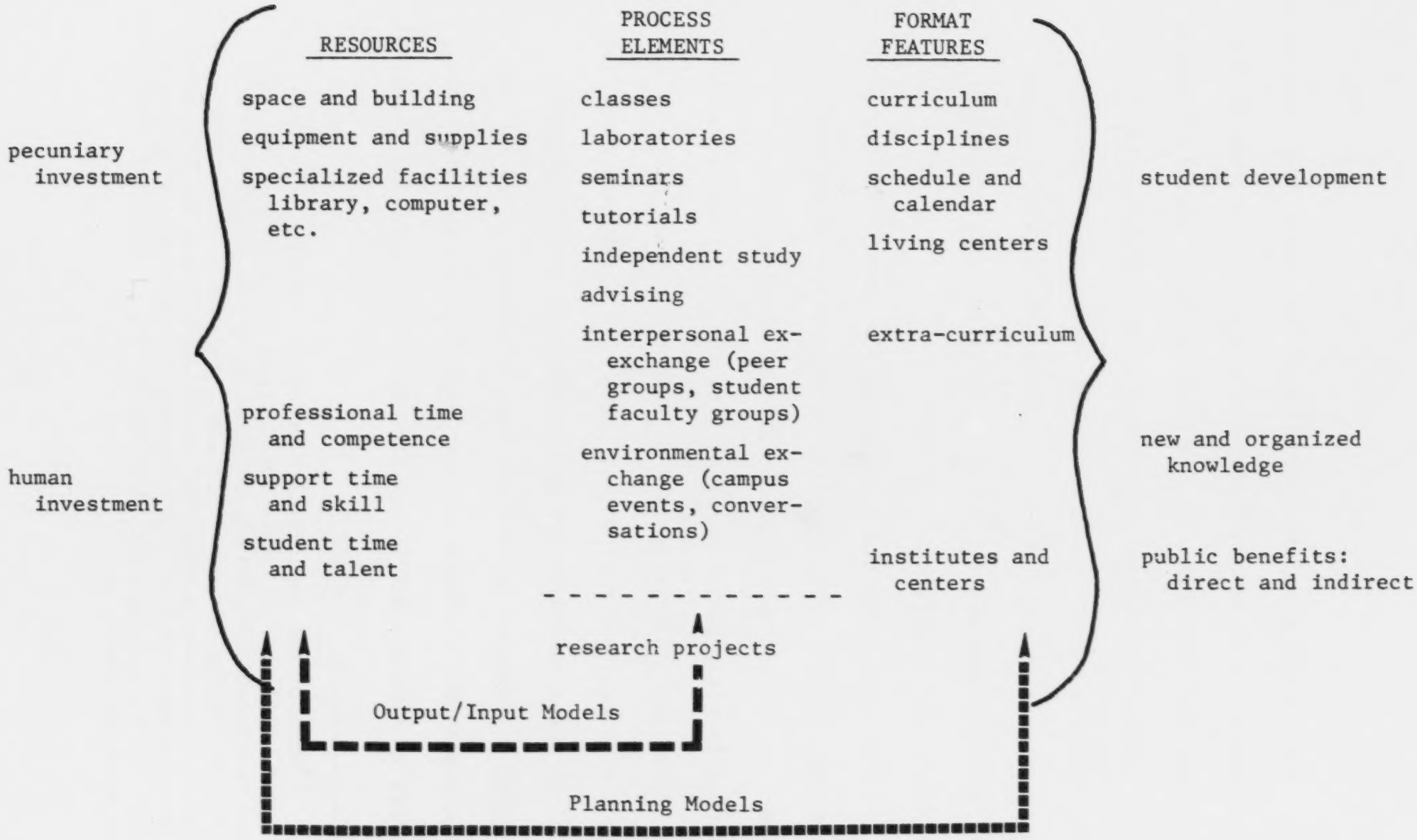
[4]Much of the inquiry is devoted to "faculty work load." Useful bibliographic summaries include Terry Leigh, *Selected and Annotated Bibliography on Evaluating the Performance of College Faculty Members* (Lexington, Kentucky: University of Kentucky, Program on Educational Change, 1969) and Keith Trowbridge, "Faculty Work Load -- A Bibliography." Information Series I, nos. 2 & 3, mimeographed (Washington, D.C.: National Society of Professors, 1969).

FIGURE 1

AN IDEALIZED SCHEME OF EDUCATIONAL "PRODUCTION"



of developing nations. A second line of application concentrates upon faculty productivity, assessing either their contributions to the instructional process or their individual professional accomplishments. This approach is probably the oldest of the three and reaches back to the turn of the century. A third approach has entertained the question of institutional productivity in all its dimensions and probably represents the least developed aspect of the matter. Throughout, when choices have been made they have leaned toward those aspects of the question which relate most closely to institutional analysis and planning rather than toward theoretical speculation.

I. The Idea of "Production" in Higher Education

A. THE INDUSTRIAL PRODUCTION MODEL

One of the most successful tools of the industrial economist is the notion of a production process in which a series of inputs is combined by some process to yield outputs. Although simple in the extreme, this design is attractive because it allows for the development of great complexity as each of its components is expanded. This particular form is easily communicated to a variety of audiences and encourages a wide-reaching set of analogies. Solomon Fabricant offers the following brief explanation:

> Productivity . . . refers to a class of empirical output-input ratios that is widely used in economic history, economic analysis, and economic policy. In one sense, productivity measures the fruitfulness of human labor under varying circumstances. In another sense productivity measures the efficiency with which resources as a whole, including capital as well as manpower, are employed in production. In still another sense, productivity measures the forces that underlie the trend of real wages. And in a fourth sense, productivity measures a major factor in the determination of labor or capital requirements. Productivity measurements are addressed to important questions . . . Some questions are best answered with one kind of productivity measurement, and other questions with other kinds. . . . In addition, there are some forms that simply reflect the dearth of statistical information.[5]

Such a definition not only permits the management of great detail and complexity, but also allows the combination of simpler elements into forms that relate to a significant segment of macro-economics, national income accounting.[6] Output per man-hour has become an important national and international index of

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[5]Solomon Fabricant, "Productivity," *International Encyclopedia of the Social Sciences* 12 (1968): 523.

[6]Mary Jean Bowman, "Economics of Education," in *Financing Higher Education: Alternatives for the Federal Government*, Monograph 5, ed. M.D. Orwig (Iowa City, Iowa: The American College Testing Program, 1971), p. 39.

economic performance.[7] A similar set of input-output relationships has been used in physics and applied by various technologies to assess work efficiency. This application probably antedates the economists' use of the idea and reflects the pervasive influence of mechanical analogs in much of our current analysis. The ratio of output to input, with each expressed in identical units, yields an index of work or power efficiency.

The production operation takes place over time. The output-input model describes the key features at each end of the process and provides an index to their effectiveness. A productivity ratio compares the output to input at a particular time. Ideally such an index includes all the inputs and all the outputs or "total factor productivity." This condition is rarely achieved, and most often the ratio appears as "a comparison of an output with one or more of the resources used in producing the output."[8] In the absence of complete information, the economist usually selects one of two broad modifications. "One includes those measures which relate output of a producing enterprise . . .

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[7]Jerome A. Mark, "Concepts and Measures of Productivity," *The Meaning and Measurement of Productivity*, Bulletin 1714 (Washington, D.C.: Department of Labor, September 1971), p. 12.

[8]Fabricant, "Productivity," p. 523.

to one type of input such as labor, capital, energy, etc.; the other includes those which relate output to a combination of inputs extending to a weighted aggregate of all associated inputs."[9]

Each component of the ratio merits more detailed attention before we turn to the special case of higher education. Inputs under the classical economic description are considered to be: labor usually in the form of units such as man-hours, often specified as to skill level; capital, which may take a variety of forms including equipment, organizational devices, or knowledge in the form of technology or management skill; land which represents a special kind of resource; and raw materials.

Outputs, the outcomes of the process, usually take the form of goods but they can also be described as units of service. In some cases they are even treated as a money increment of value-added. It is highly desirable to establish a single indicator of output to avoid the complex interrelationships that arise from the permutation of three or four inputs and a like number of outputs. Industrial operations are usually directed toward a single goal or a few products and services, so this constraint raises no major difficulties.

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[9]Mark, "Concepts and Measures," p. 7.

When a series of measurements is available over time, changes in the productivity ratio can be taken as a measure of changes in the efficiency of the production process. Strictly speaking, a true efficiency index would require the consideration of all inputs, that is, total factor productivity. In practice the output per man-hour is often taken as an indication of labor efficiency, and output per dollar invested is seen as the indication of capital efficiency. If monetary values are assigned to the inputs, then a unit cost (cost ÷ output) is generated as an efficiency index. In this case, it is particularly important that all the significant real inputs be properly evaluated.

It is clear that the simple elegance of the output-input notion has a great many advantages. To begin with there is almost universal understanding of the relationships in this mechanical form. Then too, the concentration upon outputs and inputs avoids the complexities of the intermediate stages in the process of production itself. Advantageous, too, is the fact that it can be applied to anylevel of an organization. When common indicators are used, money values for example, data from various levels can be accumulated or fitted into linear relationships. There is also a practical benefit in that the initial analysis of output and input factors constitutes an excellent prelude to more sophisticated schemes. We have already noted the flexibility

this concept offers in testing the effectiveness of each one of a variety of components. Finally, the application fixes a condition at one point in time and the successive readings encourage comparisons in time series form.

B. CAVEATS, FLAWS, AND FALLACIES

In undertaking a criticism of the model we have just described, it is probably most useful to begin by looking at a few ways in which it has been applied. Then we can look briefly at those limitations intrinsic in the output-input scheme itself, develop the difficulties associated with its application, particularly on the micro-economic level, and finally turn to the characteristics of education which make an adaptation difficult.

1. Fitting the Model

One can proceed quite far with the output-input notion simply by reducing realities to fit the constraints of the model. The best illustration of such a reduction is found in the use of a cost per student index. By dividing educational and general expenditures reported for colleges and universities by enrollment, it appears that the cost per student increased from $929 in 1955 to $1810 in 1968.[10] Obviously a number of

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[10]Howard R. Bowen, "Financial Needs of the Campus" in *The Corporation and the Campus*, ed. Robert Conner (New York: Columbia University, Academy of Political Science, May 1970), p. 80.

adjustments for part-time students, the effects of inflation, and the character of the program should be introduced. The commonest method of reporting is to use costs per full-time equivalent student ($\frac{FTES}{C}$).[11] Another simplified index in wide use is dividing the number of student credit hours (SCH) produced in the course of a year at an institution or group of institutions into costs to give per credit hour expenditure. Despite their obvious shortcomings both of these devices are widely used. Of the five schemes suggested recently for federal support to institutions, two used a modification of the cost per student index.[12] Student credit hour output has been widely used in state funding formulas notably in Ohio, Kentucky, Texas, California, Florida, and Virginia.[13] This type of index embodies its own kind of problem, however, because its very convenience leads to misapplication and encourages oversimplification.

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[11]Hans H. Jenny and G. Richard Wynn, "Expenditure Expectations for Private Colleges," *The Economics and Financing of Higher Education in the United States,* Joint Economic Committee of the Congress (Washington, D.C.: U.S. Government Printing Office, 1969). This study illustrates the development of such an index for a comparative study of a group of approximately thirty colleges.

[12]R.L. Farrell and C.J. Anderson, "General Federal Support for Higher Education: An Analysis of Five Formulas," in *Financing Higher Education: Alternatives for the Federal Government,* Monograph 5, ed. M.D. Orwig.

[13]James L. Miller, Jr., *State Budgeting for Higher Education* (Ann Arbor, Michigan: University of Michigan, Institute of Public Administration, 1964).

It is also possible to increase the complexity of the output-input model by including as many variables from the real situation as one can safely identify. This has been done with great skill and on a broad scale in a recent study by June O'Neill. Her data is distinctive for its inclusion of an assessment of the value of capital inputs to higher education. The general conclusion is that the relation of output -- indicated by student credit hours -- to input -- all expenditures associated with instruction -- has remained just about constant since the mid-fifties.[14] The introduction of computer based analogs has made possible much more elaborate treatment of the input factors. Where the output-input model is in use, the efforts are directed toward this end.

Before entering a detailed criticism of the output-input model, two points should be made. First, there is widespread public use of these very simple indicators, built up over the years in the absence of more adequate measures of educational activity. These simplisms will have to be met and dealt with in the legislatures, in the press, in public discussion, and even among faculty for a long time to come. The second point

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[14]June O'Neill, *Resource Use in Higher Education* (Berkeley, California: Carnegie Commission on Higher Education, 1971).

is more encouraging. At the applied level, the notion of a single economic index or even a good collection of indices has not been very successful even in the business world. "We've been trying for thirty years to figure out how to measure productivity and we still don't know how to do it," grumbled an executive of one of the country's half-dozen biggest companies.[15] This should serve to alert the academy in two directions. First, there are not many ready-made practices or prototypes from business management to be applied to university operations. Second, there is every opportunity to explore and develop new principles specific to the academic world.

2. Limitations in the Model Itself

There are two constraints and one chronic difficulty that are inherent in the output-input model. In normal usage the disparate inputs are catalogued and the outputs are recorded, but there is no information offered about the process or activity that intervenes. While experimental changes in the process may be introduced, the particular format in which the data are set tells nothing about how different effects may have been

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[15]"The Week in Review," *New York Times*, Section 4, November 14, 1971, reported in connection with Phase 2 of Nixon's economic controls which relate productivity to pricing.

achieved. Armitage and Smith use the apt comparison of a slot machine, the "one-armed bandit," where one pulls the lever (input), reads the windows (output), even collects the winnings, without knowing what is going on inside the black box.[16]

A second limitation is related to the first: the results are fixed in time. The quantities represent static values with the result that dynamic factors of change, accelerating or falling rates, must be inferred rather than measured directly, and they are achieved only after the fact, too late to modify the processes of production.[17]

The chronic difficulty lies in the fact that attributes of quality are almost inaccessible. Speaking of cost per student data, William G. Bowen observed, "Even if universities existed solely to educate students, we would want a measure of output expressed in qualitative as well as quantitative terms and here again it is by no means obvious how to proceed . . . the difficulties of allowing for variations in quality which plague the construction of cost

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[16]P. Armitage and C. Smith, "Mathematical Models in Educational Planning," in *Economics of Education* 2, ed. M. Blaug (Baltimore, Maryland: Penguin Books, 1969).

[17]M. Blaug, "The Productivity of Universities," in *Economics of Education* 2, ed. M. Blaug, pp. 315-316.

and price indices of all kinds with special force to the field of education."[18]

3. Problems of Application

A primary task in reducing theoretical concepts to measureable operational units involves identifying the appropriate components and constructing appropriate unitary measures. As noted previously, this is a fundamental challenge in the sciences. Presumably, the unit should incorporate as many dimensions of the concept as possible, and the omitted aspects should be known to the user. Units must be objectively defined, interchangeable, and susceptible to manipulation by at least the simple arithmetic processes of addition and subtraction.[19] The units developed for input should correspond to those used to express output or, if not identical, they must at least relate in some evident way. Blaug, for example, emphasized

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[18] William G. Bowen, "Economic Pressures on the Major Private Universities," *The Economics and Financing of Higher Education in the United States*, Joint Economic Committee of the Congress, fn. p. 409.

[19] Amatai Etzioni and E.W. Lehman, "Some Dangers in 'Valid' Social Measurement," *The Annals* 373 (September 1967): 1-15.

the importance of defining the variables for educational activity in terms of "constant quality."[20]

In education the identification of components that can stand as inputs and outputs has been particularly troublesome. Students enrolled differ markedly, not only on inherent characteristics such as intelligence, motivation, and energy but also on extrinsic characteristics like field of study, full- or part-time attendance, resident or commuting status. Hours of class time are so different in their content and effects that they have little more in common than the clock which measures their passing. The danger of fractional measurement, using the most convenient rather than the most accurate dimension of a phenomenon, is illustrated in the decisions of several legislatures -- and Governor Reagan -- to specify the number of "contact" hours required of each full-time faculty member.[21] Credit hours

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[20]Maureen Woodall and Mark Blaug, "Productivity Trends in British University Education 1938-1962," *Minerva*, September 1965, pp. 483-498.

[21]Richard L. Miller, "Prescribing Faculty Work Loads," in *New Teaching New Learning*, Current Issues in Higher Education 1971, ed. G. Kerry Smith, published by American Association of Higher Education (San Francisco, California: Jossey-Bass, Inc., 1971), pp. 202-209, and Governor Reagan's speech, June 22, 1971 at the Commonwealth Club in San Francisco: "Unfortunately, teaching has been neglected or downgraded. Figures for thirty-six randomly selected UC departments were 4.3 classroom hours a week per faculty member. The University's published average for 1969-70 was 6.7 hours, and the estimate for the current year 7.2 hours. Our budget assumes the faculty will teach 9 hours a week." (*College and University Business*, November 1971).

have a symbolic quality that give a somewhat more complete reflection of the instructional process, and over the years this has become the principal unit with which to express output when data are needed for internal analysis.

The range of arguments for and against a compromise position in defining output-input has been wide. Those at one extreme assert that even the most elementary measurement is at least an approach to a problem that must be met. In the opposite position are those who maintain that we are so unclear in our definitions of educational activity and its effects that any selection of a few items for measurement will lead to misplaced resources and public misunderstanding of the educational mission. Recognizing these difficulties, the Western Interstate Commission for Higher Education undertook a full-scale study of the problem of defining output. These WICHE papers explore the concept of output, including a wide range of noneconomic items which fall closer to the heart of the educational process.[22] The effort marks an important contribution, for it has become clear that, while definitions based solely upon economic terms may be insufficient, the output-input relationship might prove

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[22]Ben Lawrence, George Weathersby, Virginia Patterson, eds., *Outputs of Higher Education* (Boulder, Colorado: WICHE, 1970).

more useful if measures such as test results, personal inventories, or attitude scales were adopted as output.

The economist prefers to avoid such divergence and therefore perceives the problem in another way. "It is easy enough to say that universities educate students, create and preserve knowledge, and, to an increasing extent, perform these traditional functions in ways intended also to advance the welfare of neighboring communities and society at large. It is far more difficult to measure the degree to which any of these objectives is achieved, let alone measure all of them in ways which permit one to estimate 'total product.'"[23]

The difficulty of identifying input and translating it into units that can be measured is equally complex. Faculty time in hours of credit hours appears to be a good measure of labor input but, as later paragraphs will show, it is quite misleading. As soon as one moves toward any other inputs -- capital, equipment, organization, or raw material -- the dilemmas of proper identification appear. How important is space, and does its character -- library, classroom, laboratory -- have any importance? What is the relative importance of

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[23]William G. Bowen, "Economic Pressures on the Major Private Universities," p. 409.

technical equipment in improving instructional output? Does capital wealth in terms of endowment have any validity as an input to the educational process? In the case of input, it would be profitable, as we have noted in the case of output, to move away from the narrower view of economics and explore the full range of nonmonetary inputs. Much research has already been done in identifying factors like campus climate, or peer group influence, and these are very significant inputs to the educational experience.[24]

Another set of problems is generated when one attempts to assign values to the units that have been identified. As Blaug notes ". . . productivity properly measured is a relationship of physical input to physical output. . ." but "there is simply no way of adding so many people to so many tons of concrete or to so many pounds of library books unless they are expressed in terms of a common denominator."[25] The usual way around this dilemma is to assign money values to each component, thereby reducing them to a common denominator. But valuing

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[24]Robert H. Berls, "An Exploration of the Determinants of Effectiveness in Higher Education," *The Economics and Financing of Higher Education in the United States*, Joint Economic Committee of the Congress, pp. 207-260. This article offers a good summary of the nonmonetary correlates of individual change in the educational setting. See also Stephen B. Withey, ed. *A Degree and What Else?* (New York: McGraw-Hill Book Co., 1971).

[25]Blaug, "The Productivity of Universities," p. 315.

in this way is, in effect, pricing. In our economy, prices are generally held to be established by the operation of a market mechanism, real or assumed.

Now it is immediately apparent that these pricing requirements for the operation of the equation are met either imperfectly or not at all by the educational process. For example, almost none of the inputs or outputs of education are subject to open market evaluation. The costs of many of them, however, can be established by assuming a market condition. The rental value of buildings, the costs of professorial time, and the worth of equipment can all be imputed,* but when the output stage of education is examined for value-added, no method of assessing market value exists. Degrees, credit hours or contact-hours are never subjected to open market conditions. To cope with this absence of a direct market mechanism by which the inputs and outputs of education are assigned prices to reflect their value, a further major assumption is often introduced. It is assumed that the amount paid by educational institutions for services or equipment, the cost, is in fact the product

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*The accounting practices of most institutions add to the difficulty because equipment is not depreciated, real estate is not reassessed to reflect true market conditions, and endowment is not always evaluated in relation to the market.

of some broadly based market influence. The "value" of professorial services for which a faculty member is paid $20,000 is assumed to be exactly that amount. To obtain the "value" of output in the absence of a market mechanism one simply totals the costs. Thus, if our hypothetical professor teaches 100 students the output value is $200 per student. By taking all assignable costs as equal to output value, one can gain some advantage in comparing one cost pattern with another. In other words, the question of output is put aside, and only the variations in the inputs are examined.[26] This approach is more useful than one might assume from this brief summary, and the recent study by Bowen and Douglass covering comparative instructional costs in liberal arts colleges demonstrates its worth quite clearly. They have carefully costed five plans of instruction ranging from a heavy tutorial scheme to a large class size design and then prepared an eclectic design which demonstrates the economic feasibility of a mixed mode of instruction.[27] But having

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[26] John Vaizey, "The Outputs of Higher Education -- Their Proxies, Measurement, and Evaluation," *The Outputs of Higher Education*, ed. Lawrence, Weathersby, and Patterson, pp. 19-23.

[27] Howard R. Bowen and Gordon K. Douglass, *Efficiency in Liberal Education* (New York: McGraw-Hill Book Co., 1971).

answered the question as to which combination of inputs gives the more favorable cost structure, we are still left with the problem of evaluating which gives the best combination of outputs. O'Neill described this problem in the preliminary remarks of her study. "The first stumbling block in measuring quality change is that there is no meaningful system of market prices which can be used to distinguish quality differences among recognizable types and kinds of schooling. . . . The best that can be done is to substitute cost differences for price differences. Unfortunately, we do not know how well cost differences will reflect quality differences in the setting of a nonprofit system with varying combinations of private philanthropy and public subsidy."[28]

Still other problems arise when inputs and outputs are translated into monetary values. Once into the practice of using monetary indicators, it is difficult to recapture or relate to the real elements of teaching and learning. As Balderston observed: "Because of budgeting in monetary terms we seem forced to account in those terms."[29] By attempting to account for

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[28]June O'Neill, *Resource Use in Higher Education*, p. 5.

[29]Frederick E. Balderston, "Thinking About the Outputs of Higher Education," in *Outputs of Higher Education*, ed. Lawrence, Weathersby, and Patterson, p. 11.

their activities in monetary terms, institutions of higher education have subjected themselves to many of the same criteria that apply to profit-maximizing organizations while at the same time they lose an opportunity to demonstrate their real accomplishments. As one observer concluded: "No wonder . . . there has been little progress in measuring the outputs of universities. Existing techniques were designed for organizations with an incentive to produce efficiently an agreed-on product."[30]

In the paragraphs above we have noted that the output-input model forces the reduction of complex terms into convenient measureable form, that even more extreme assumptions are required if that form is a monetary one, and finally, that acceding to these requirements brings education into judgment on the basis of criteria that are not wholly applicable. To quote Brandl again, ". . . attempts to estimate production functions for education -- to define and measure critical outputs of the educational process -- have been unsophisticated in technique and disappointing in results."[31]

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[30]John E. Brandl, "Public Service Outputs of Higher Education," in *Outputs of Higher Education*, ed. Lawrence, Weathersby, and Patterson, p. 87.

[31]Ibid., p. 86.

4. Characteristics of Education to be Considered

Having examined the limitations inherent in the model itself and the problems which arise in fitting colleges and universities to the design, we now turn to some of the special attributes of education that are not adequately accounted for by the output-input assessment of productivity.

Economists place higher education in the class of industries described as "labor intensive." This means that personnel represent an unusually large part of the operation. Most service industries fall into this category, while colleges, hospitals, and, to an increasing extent, government are distinguished further within that class by their large professional population. Higher education illustrates the point quite simply because about half the total budget or 65 to 75 percent of the instructional budget goes to faculty salaries.[32] Because labor represents such a major share of the direct costs, it has been tempting and quite in line with the practices of industrial economics to fix upon faculty labor as the determinant input.

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[32]Seymour Harris, "Financing Higher Education: An Overview," *The Economics and Financing of Higher Education in the United States*, Joint Economic Committee of the Congress, p. 489.

"Productivity" per faculty member in terms of some convenient output unit is seen as the best indication of effectiveness. We have noted already the use of several oversimplified measures that have come into general use, e.g. student-faculty ratio or student credit hours (SCH) per faculty member. This practice might be labeled a "labor only" approach to input.

Under certain conditions of a labor intensive operation a singular emphasis upon the labor factor alone may be misplaced in assessing productivity. From his studies of the service sector, Victor R. Fuchs has identified several other items that have effects on service industries. ". . . the consumer frequently plays an important role in the production of services. This unmeasured input can have significant effects on productivity in retailing, health, education, and many other service industries." The one which has particular importance for higher education is "labor embodied technological change."[33] Where the relationship between labor and new technology is very close, as it is when labor must be newly trained to use new technology or when acceptance by labor determines the degree

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[33]Victor R. Fuchs, *The Growing Importance of the Service Industries*, Occasional Paper 96 (New York: National Bureau of Economic Research, 1965), p. 30. See also Victor R. Fuchs and Jean A. Wilburn, *Productivity Differences Within the Service Sector*, Occasional Paper 102 (New York: National Bureau of Economic Research, 1967).

to which technology will be incorporated in the production process, then special attention must be directed to this factor as well as simple man-hour input.

Apart from omitting factors which might be crucial to productivity, the simplified view, which sees the faculty input as the only important one, propagates a couple of ideas that are detrimental to a true analysis of what is going on at a university. The first of these errors is the assumption that faculty only teach when in fact they do much more than teach, i.e. conduct research, administrative work, and public service projects. The second error confuses instruction and learning. Much of what faculty do beyond instruction contributes to learning, and much of what students do apart from classes is part of learning. The ultimate danger to education of a narrow view, which weighs only part of a labor input in the measurement of a labor intensive activity, is that teaching time will be manipulated and the real productivity in terms of the total learning experience be damaged. Singular emphasis on faculty input also neglects consideration of what has happened in most other sectors of the economy. In the short run and over the sweep of history it has been the increased application of capital, first in terms of power and later in the form of technology and management, that has yielded higher productivity.

This leads us to another characteristic of education at the higher levels, another characteristic not amenable to the output-input view in its usual format. It is not only labor intensive but also "quality intensive." That is to say, the *way* in which education is carried out has qualities that must be preserved. How it is done, what happens between input and output, is the heart of the matter. Earl Cheit and others have used the analogy of the symphony orchestra, also a labor intensive and quality intensive organization.[34] The orchestra is limited in how many engagements it can play per week before its repertoire deteriorates and the performance declines. It cannot play faster or louder. The number of members cannot be increased to 200 to yield more output. In short, the quality of the process itself, not just the outcome, is a part of "production."

One consequence of this condition for higher education is that technological improvements and much of the capital investment have gone into the quality of the experience rather

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[34]Remarks as a panelist on the topic "The Financing of Higher Education" at the Pennsylvania Association of Colleges and Universities. 75th Annual Meeting, Pennsylvania State University, University Park, Pennsylvania. October 19, 1971. The idea is considered at some length in William J. Baumol and William G. Bowen, *Performing Arts: The Economic Dilemma* (New York: Twentieth Century Fund, 1966).

than into quantitative output. In a sense, the added investment has been swallowed up in "through put" rather than reflected in output. The addition of sophisticated equipment and facilities, from computer installations to carefully designed "wet labs," illustrates the steady increase of capital application at colleges and universities. But these contributions go into the quality of the experience, into the process, rather than into the outcomes as measured by the usual methods. Economists have noted that "in most industries new technology tends to cut costs, but in higher education it has the opposite effect."[35] Not only investments in technology, but also investments in personnel have been made in forms which increase quality. There is more doctoral and postdoctoral training among faculties, more highly trained personnel in library and laboratory, all returning better service.

Taken together, the quality-intensive, labor-intensive character of advanced education generates an unusual set of conditions. If all the acceptable criteria of productivity are indeed quantitative, then only two courses of action are open to the representatives of colleges and universities. One path

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[35]Howard R. Bowen, "Financial Needs of the Campus," p. 87, and Seymour Harris, "Financing Higher Education," *The Economics and Financing of Higher Education in the United States*, Joint Economic Committee of the Congress, p. 491.

lies in finding combinations of qualitative improvement that can be translated into the usual terms of measurement. This is little more than a tinker's solution, for it usually results in juggling dollars, faculty, and students to fit a formula. The second approach would be to examine and experiment with inputs of capital and technology in ways specifically aimed at actual increases in quantitative output.

This is a bolder course than it might first seem. Even though capital increases to institutions were large over the past decade, there is a strong possibility that they have not yet reached the level which would allow for the use of enough sophisticated technology to produce measureable quantitative improvement, i.e. teach more students well. The costs of an extended video teaching system, an auto-instructional network, or a highly flexible information retrieval system is probably beyond the scope of planning for most educational managers and faculty. We are quite used to thinking of ten million dollar buildings, but whether a multicampus network to support independent study at half that price would find public or even university approval is doubtful.

A third attribute of education also tends to make it incompatible with output-input formulas. Higher education deals with what a businessman might call "knowledge futures." At

the point of the degree nothing is finished except the formal education. It is the "commencement" of real outputs for the individual and for society, and they do not cease until a lifetime is nearly complete. Gained are the personal effects of intellectual growth, emotional, and social enlargement which we know to be the essence of the activity, and yet they are unaccountable. The social effects of educated individuals acting singly or in concert to advance the interests of the whole society constitute additional output. These are so important that they are often treated in macro-economic as the yield on society's investment in its human capital.[36]

Still another obstacle, again a fundamental one, stands in the way of easy application of the production idea. The university and the college have a peculiarity of organization that sets them apart from most other corporate structures. "The main pattern of academic organization is associational rather than bureaucratic. It does not stress 'line' authority; since basically all full faculty members are formal equals. . . . Indeed relative freedom from authority of organizational 'superiors'

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[36]T.W. Schultz, "Resources for Higher Education," in *Financing Higher Education: Alternatives for the Federal Government*, Monograph 5, ed. M.D. Orwig, p. 22.

is one of the main aspects of academic freedom."[37] As practicing professionals, the manner in which individual professors carry out their essential duties is considered to be within the sphere of professional autonomy. The institution, with their participation, may determine what is to be done by way of constructing curricula. The way in which the defined or understood purpose is carried out, the "how" of it, is left to professional judgment of the individuals and not to the directive administration of the bureaucracy. These professionals are also involved in more than directly serving the goals of the institution, in the sense that they participate in the larger world of knowledge and in the extended community of their profession. The distribution of their time, the "man-hours" of conventional economic labor input, is within the sector of professional autonomy rather than the purview of management.

In one sense the professoriate represents a subsystem in which the time, intellect, and efforts of a group of individual professionals generate a number of outputs. Part of the output is research, manifested in publications, reports, ideas, and talks. Part is given over to professional contact and exchange in ways that are only indirectly related to the college or

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[37] Talcott Parsons, "The Academic System: A Sociological View," *The Public Interest*, Fall 1968, p. 176.

university. A block of instructional time constitutes only one segment of a professor's output, and in turn, it becomes an input to the instructional system of the institution. This confusion of "input" and "output" labels is another evidence that the simple production model is inadequate to the reality of the activity.

While the input of labor is represented by a group of practicing semiautonomous professionals, the output of higher education is most often evaluated on the basis of some phase of institutional performance. There is a strong temptation on the part of both laymen and business oriented analysts to overlook this distinction. The notion of a collegial group of independent professionals practicing in an institutional setting appears to be a subtlety of only casual interest. In point of fact, it is the independent practice of the professor that gives quality, depth, and flexibility to the process of higher education.

The extent of these problems in meaning and intention is so vast that many academics feel the whole notion of specifying inputs and outputs should be put aside. "The university was conceived as a place of opportunity for those who want to learn, not as a manufacturing enterprise guaranteed to mold learned people out of intellectually passive, if politically active,

matriculants."[38] "The university is not a production line enterprise. There is no delivery to a university receiving dock of identical components to be pushed up stream through a rigid program to come out as identical products at the end of the curriculum line."[39]

Summary

We have examined the production model in considerable detail because, in one form or another, it is in widespread use and because this usage has developed almost without decision. The output-input format adopted from industrial economics is not well suited either to indicating effectiveness or to analyzing the activity of higher education.

The model provides little information about the process itself, presents measures that are fixed in time and after the fact, and renders quality assessment difficult. Proper application of the output-input model requires that all components be clearly specified and expressed in comparable, measureable units. The values of those units should be subject to determination by a market mechanism. The nature of the educational

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[38] George E. Pake, "Whither United States Universities?" *Science* 172 (May 29, 1971): p. 911.

[39] W. Clark Wescoe, "The Use of University Resources," in *The Corporation and the Campus*, ed. Robert Conner, p. 48.

process itself has characteristics that are not well accounted for. It is labor intensive in a special way, is quality intensive, deals in knowledge futures rather than immediate product output, and maintains an organization that has an associative rather than bureaucratic form.

Pursuit of this model has led to (1) overemphasis on direct instruction to the exclusion of other functions of the university, (2) adoption of faculty time as a proxy for all the elements of instructional inputs, (3) acceptance of such fragmentary measures as credit hours to indicate outputs, (4) inattention to the process of learning, (5) public usage of measures that reflect almost none of the improvement in quality that have occured in educational practice, and (6) insufficient consideration of the effects of capital inputs in the form of technology, organization, or equipment. We can concur with Brandl that "Economic analysis, which has fostered the output orientation, is not appropriate for finding or measuring educational outputs."[40]

This extensive criticism certainly does not invalidate the model. It does not even suggest terminating its use in higher

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[40]John E. Brandl, "Public Service Outputs of Higher Education," p. 90.

education. Offered as a conclusion is the judgment that it is not a suitable device for fully assessing effectiveness on the institutional or micro-economic level.

C. MOTIVES FOR MEASURING PRODUCTIVITY

1. Sources of Current Concern

In the climate of today the origins of concern over productivity in higher education are so clear as to seem self-evident. Institutions find that resources are not increasing at a rate that permits development in all the directions their recent explorations have opened. In 1970-71 twenty-seven colleges and universities were unable to meet even the minimum operating conditions. To the internal problem of allocating scarce resources has been added the increasingly difficult task, of obtaining basic funding from public sources and sometimes from private sources as well. Appropriating agencies, most often elected legislatures, function as brokers rather than producers. Their allocations, for whatever purpose, must be justified to the taxpayer. So long as the premises underlying expenditures for welfare, mental health, public safety, and education enjoyed unquestioned public acceptance, there was no need for constant justification. In the face of public skepticism, however, allocating agencies are forced to turn to the institutions themselves for explanations.

Persons who have been active analysts of higher education for some time emphasize the nature and the urgency in these new conditions. "It is incumbent upon higher education, which above all institutions should be characterized by an insistence on rational process, to provide assurance that it is consuming resources effectively."[41]

From the viewpoint of those who supply the funds the question is:

> What are *reasonable* standards (of cost per student), taking into account alternative uses of scarce resources involved? What funds are genuinely needed to maintain an adequate educational system for America at the late twentieth century? These questions are often asked by governors, legislators, and donors.[42]

And there is that note of urgency:

> If optimum use of resources, a matter of relatively little concern in the 1960s, is to be the battle cry of the 1970s where do we start?[43]

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[41] J.A. Kershaw and A.M. Mood, "Resource Allocation in Higher Education," *American Economic Review*, May 1970 (supplement), p. 341.

[42] Howard R. Bowen, "Financial Needs of the Campus," p. 81.

[43] Rexford G. Moon, Jr. "Beating the High Cost of Low Ratios," *Liberal Education* 57, no. 2 (May, 1971): 161.

2. The Sources of Early Interests

We need to remind ourselves that using the productivity idea to justify the execution of a public trust is a relatively new application. Even the use of productivity information as a component of management decisions is recent. In the past, the purposes of productivity analyses in the academic sphere have been quite different, and many of the techniques used to assess productivity were developed around these earlier purposes. As Richard Axt pointed out, "when output data are presented, the technical assumptions are usually specified but the basic assumptions, the very premises of the study, often are not stated." His examination yielded several assumptions in 1960, which are still at the root of some studies. "One of the most important assumptions is that *equity* is important -- equity among individual faculty members, among departments, and among institutions. . . . A second assumption . . . is that there is a relationship (inverse) between work load, class size, and the quality of education.[44] A third assumption was that credit hours or contact hours taught somehow reflect the total work activity of the faculty members.

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[44]Richard Axt, "Assumptions Underlying Present Ways of Measuring Faculty Load," in *Faculty Work Load: A Conference Report*, ed. Kevin Bunnell (Washington, D.C.: American Council on Education, 1960), pp. 12-13.

Much of the early attention to faculty activity was motivated by the search for an "equitable" work load. The chapter on "Instructional Load" in the classic study by Reeves and Russell opens with this sentence: "One of the most difficult problems confronting a college administration is that of equalizing the loads of members of the teaching staff."[45]

Caplow and McGee's fundamental work includes a recommendation aimed at equity in the distribution of assignments.[46]

Stecklein mentions the same purpose for work load analysis as one of two important functions the data can serve.[47] Even contemporary attention to the question of faculty effort contains

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[45]Floyd W. Reeves and John Dale Russell, *College Organization and Administration* (Indianapolis, Indiana: Disciples of Christ, Board of Education, 1929), p. 165.

[46]"That a standard teaching load expressed in class hours, be adopted in all departments of the university for all members of the teaching staff." T. Caplow and R.J. McGee, *The Academic Marketplace* (New York: Basic Books, Inc., 1958), p. 242.

[47]"There are two basic reasons why the systematic collection and analysis of faculty load data are important: (1) to give administration a better picture of the activity of their faculty . . . (2) to provide a firmer basis for assignment of loads to new staff members . . . ." James E. Stecklein, "Methods of Analyzing, Expressing, and Reporting Faculty Load Data" in *Faculty Work Load*, ed. Kevin Bunnell, p. 26.

vestiges of this concern. The University of Texas faculty study notes: "It is also anticipated by the committees that the Faculty Work Load Formula System will provide an equitable method of balancing faculty work loads. . . ."[48]

When enrollments began to rise rapidly in the early 1960s, the context of the faculty work load question altered. The WICHE Seminars in 1961 and 1962 dealt with the short-range planning by which new faculty could meet the imminent needs. It was only a small step to the use of similar data for long-range planning, and this motivation appeared in the mid-sixties.

It was at this point too, that new considerations appeared in the form of statewide planning, often for multi-institutional systems of colleges and universities. Hitherto, information on faculty work load had been used largely within the framework of a single institution, though there had been tentative efforts to analyze state systems. John Dale Russell and James I. Doi had given careful attention to a variety of measures that might be applied to higher education and concluded that for "measuring economy of operations, the most relevant are those that show efficiency of use of faculty manpower." For their consideration of

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[48]Ad hoc Faculty Committee and Ad hoc Deans' Council Subcommittee on Faculty Work Load, *Report to the President on the Faculty Work Load Formula System* (Austin: University of Texas, June 6, 1971), p. 35.

the New Mexico System, Russell and Doi found the best single measure for their purposes to be the "average student credit number hours per full-time faculty members."[49] Their conclusion was confirmed by others and this particular index was adopted by a number of statewide studies into the middle sixties. Even the proponents of these simplified indexes inveighed against using them without interpretation. Doi suggested certain guidelines to avoid exaggeration and misinterpretation.

> We continue to use student-faculty ratios and such units as credit hours and class hours because they are familiar concepts and part of the language of the campus. But all the while we know that such data are terribly misleading and hope that those who refer to them will be mindful of this fact.[50]

The demand for generalized information about university operations and the workings of statewide systems was beginning to overrun the techniques that had been developed. So long as faculty load data, credit hours generated, or degrees produced was used for internal purposes it was possible to introduce corrections whenever good judgment seemed in jeopardy. Once a piece of data, -- a ratio, an efficiency index -- came into the public domain, however, such refinements were no longer possible.

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[49] James I. Doi, "The Proper Use of Faculty Load Studies," *Studies of College Faculty*. Proceedings of the Third Regional Institute on Institutional Research, July 31-August 4, 1961, at the Center for the Study of Higher Education, University of California at Berkeley (Boulder, Colorado: Western Interstate Commission on Higher Education, December 1961), p. 54.

[50] Ibid., p. 58.

With the onset of statewide planning, measures of faculty work load became synonymous with institutional output. They became instruments for comparing institutions and for estimating a system's effectiveness. Thus, devices that had been developed for self-examination became a medium for interinstitutional assessments. Indices that were meant to be used with careful interpretation were removed from those interpretations.

The last few years have seen the internal measures, originally designed for limited use, finally transformed into general public indexes. Under economic constraints, allocating agencies have picked up whatever quantitative information there is at hand and turned it to serving still another function, that of an instrument of fiscal control. Such data as contact hours, credit hours per faculty number, and cost per full-time equivalent student have become, almost unwittingly, the means by which representatives of the public interest assess the activity of higher education.

What is clear from this abbreviated historical review of the productivity idea is that the purposes for gathering such information have changed enormously in a relatively short time. Begun in an atmosphere of self-analysis, the action soon shifted to one of planning. From the context of planning to meet short-range conditions the emphasis moved to that of long-range

planning. The setting altered again toward systemwide evaluation and control. Finally and most recently, the function to be served is nothing less than communication of university activity to the public and its agents in order to justify the use of public resources. It is this need to explain and justify the use of resources in terms that can be understood by several different publics that has created the term "accountability." The conceptual framework and methods developed around the economic idea of productivity are only partially suitable to this task.

It is equally clear that the techniques for gathering data and the forms in which it is presented have been turned to purposes for which they were never intended. The same data that were developed to give approximations of one single phase of university activity -- credit hours per faculty member for example -- are now appearing in the light of public scrutiny as some composite kind of absolute indicator of what goes on in a university. Credit hour output, distribution of faculty time, student-faculty ratio, and cost per student -- all devices for internal analysis -- have been elevated to the point where they stand without qualification as the proxies of higher learning.

3. The Implications from the Past

If this analysis of changing purposes and lagging techniques is accurate, then one more priority for university effort is

clear. A primary task of any major productivity index is to communicate as complete a picture of university activity as possible to the public and to its agents. Frederick Balderston identified these agents:

> First, there are the national and state public policy makers and resource allocators. . . . Most generally these are the representatives of various public and private clienteles who feel that higher education has an impact on them: employers of the trained talent which comes from colleges and universities; users of basic and applied research findings which flow from scholarly activity; participants in the culture and the value controversies of society . . . and citizens at large who, as parents, taxpayers, and critics, display a kind of fascinated ambivalence about the importance and also the hazard of higher education in these troubled times."[51]

Open recognition of this function and the development of specific devices to serve it is vital to effective exchange between the university and its environment.

II. A Summary of Techniques for Assessing Production

A. THE QUESTION OF LEVELS

The chronicle of the motivations behind the use of the output-input idea reveals not systematic growth, but a series of

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[51]Frederick E. Balderston, "Thinking About the Outputs of Higher Education," pp. 11-12.

unplanned stages during which the methods, developed for one set of purposes, were turned to another. This development has yielded an arsenal of techniques for capturing fragments of educational production. This armory is little more than a disparate collection of devices, symbols of production, that are put together sometimes in one way, sometimes another, in an effort to describe what really happens.

While each technique may illustrate a facet of production, the crucial question is when and how it should be related to resources to assess productivity. This shall be called the question of levels. Another aspect of the matter deals with the most appropriate points at which to apply each of the needed processes: the collection of data, the aggregation of data bits, the collation of the symbols of production with resources, and finally, the publication of information. Presumably, the appropriate points have some correspondence to decision points in the organization: budgeting, policy, or program decision points.

Within the institution the question of levels is a difficult one which few institutions have met with systematic skill. In the instructional phase, the faculty member and the registrar often represent the basic collection points. Theoretically their statements on class size, hours, etc. should correspond immediately, but to achieve a congruence of these sources in practice takes a great deal of detailed work. A number of institutions --

Michigan State is one -- make the basic collection point at the department head or director level. Faculty have understandable reservations about casting information on their professional activities into a data stream whose course and flow are not quite clear. "Much of the faculty criticism of and opposition to any activities report seems to arise from a fear that university administrators will use the data in the evaluation of individuals. Such use, of course, is neither politic nor justified."[52] But resistance to the idea of reporting may produce gaps in the information system. It is probably advisable to have two means of basic collection not only as a reliability check but as a hedge or backup against sudden change in circumstances or disposition.

Further aggregation of information is usually made at the department level, then again at the college level. On the level of the whole institution it is desirable to have not only these built-up indicators constructed by successive combinations of data but also a few "global" measures. Generally a global measure is a discrete standard conceived as a reflection of some characteristic common to the whole system. These are not easily

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[52]National Science Foundation, *Systems for Measuring and Reporting the Resources and Activities of Colleges and Universities.* NSF 67-15 (Washington, D.C., 1967), p. 105.

arrived at but they operate to continuously "take the temperature" of an organization. For example, and it is only an example, reenrollment rates at the sophomore and junior level give an indication of how students have evaluated their experience in the recent past and the worth they attach to it. Some of these ideas have come under experimentation on a national scale since 1967 and the search for global indicators of institutional conditions is likely to develop rapidly.[53]

B. THE ASSESSMENT OF FACULTY ACTIVITY

The list below is intended to be inclusive of the most typical devices for measurements of activity within the university but not exhaustive in the treatment of them. The idea is to simply set some parameters to methods which have been generated by earlier output-input approaches.

1. "Teaching Load" and Other Measures of Instructional Effort

A great deal of study and discussion, much of it in the form of committee time, has gone into the problem of measuring the instructional effort of faculty members. Because coaches sit down with chemists and the teaching supervisor has a chair next

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[53] R.A. Bauer, *Social Indicators* (Cambridge, Massachusetts: The M.I.T. Press, 1966).

to the philosophy professor at such meetings, all the problems appear at once. In almost all cases the pattern for accomodating the differences is the same. A unit of time or "effort" is established as the medium of reporting. It is then adjusted for idiosyncracies of student mix, institutional emphasis, or pure prestige by the application of weightings, one or several, until an index is reached. These weightings are held to reflect more accurately one component of the faculty member's role.[54] It is quite usual to assume that these measures are not only measures of personal performance but when added up can stand as proxy measurements representative of the instructional processes.

a. Class Hours

The actual clock hours an instructor spends in class or laboratory represent the most literal unit and the simplest departure point. It is assumed that a certain number of hours of preparation accompany each class hour; two is a common judgment. It is assumed that a measure of counseling time is related to each class hour and that a fixed proportion of administrative activity, registration and the like, attaches to each hour. When these assumptions are all applied, one hour of

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[54] A convenient summary of the conventions surrounding these studies that is still quite useful is found in W. Hugh Stickler, "Working Material and Bibliography on Faculty Load," in *Faculty Work Load*, ed. Kevin Bunnell.

class time, the measured item, may be taken to stand for, say, four hours consigned to teaching and activity related to instruction. Thus an assignment of ten class hours equals a forty hour week.

b. Contact Hours

Contact hours specify not only clock hours again in class or laboratory but also actual hours in tutorial sessions, in counseling, and in thesis advising. It has been contact hours, with their suggestion of precision, that appealed to legislators. States such as Florida, Michigan, and California for example, have set their requirements in these terms. Michigan assigned the task of defining the contact hours required of universities to a state board. A more recent decision allows institutions in that state to report in either contact hours or student credit hours. A nine credit hour average annual load is equal to 300 SCH/year.

c. Credit Hours

Credit hours are by far the commonest unit of measurement for faculty activity. Although the unit is symbolic, it is presumed to bear a number of relationships to the educational program, notably to the time devoted to instruction. The credit hours assigned to a course usually relate to actual time

in some way, although studies have shown a range from 2.2 to 7.7 actual hours per credit hour.[55] Differential allowances for laboratory hours (usually 1.5 per credit hour), for upper division and graduate courses, or for independent study can be incorporated into the credit hour definitions for an instititon, thereby avoiding complex weightings. Even the more unusual types of instruction, such as coaching or individual studio instruction in the arts, can be converted to a common denominator that is understood within an institution. The flexibility of this symbol and its long history -- it goes back to the beginnings of the elective curriculum under Eliot at Harvard in 1869 and the Carnegie study of high schools -- make it the most useful and, so far, the most durable measure.[56]

The credit hour, however, has not gone unchallenged. Its relationship to instructional time or learning effort has been steadily eroded and today its value, like that of paper money, comes from its general acceptance. Future trends will move us

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[55]A.S. Knowles and W.C. White, "Educational Research and Statistics: A New Approach to Evaluating Faculty Loads," *School and Society* 49 (May 27, 1938): 683.

[56]Office of Institutional Research, "The Credibility of the Credit Hour," mimeographed (Ann Arbor: The University of Michigan, Spring 1971). I am indebted to William Lasher of that office and also to Lynn Peltier of the Institutional Research Office at Michigan State University for their comments on this topic.

further from any literal meaning and threaten further its comparability. Changing college calendars to the quarter, three term, 4-1-4 and other variations from the semester system have forced the application of conversion ratios. New curricula and new instructional programs often make the student credit hour (SCH) meaningless. Examples of these changes are the elimination of credit hour requirements for graduation (Sarah Lawrence, St. John's, Shimer), the modification of formal instruction to unconventional learning settings (Reed, Antioch, Oberlin), the design of the curriculum into either large blocks of subject matter (Hiram, San Francisco State, Hampshire) or into mini-courses (Michigan State University).[57] Finally, the credit hour is not the ideal medium for communication with laymen because it is not easily related to the work patterns of business, industry, or the independent professions.

With all its problems, and they may increase, the credit hour is still the currency of the campus. It is flexible enough to comprehend a variety of activities and to provide, after modest manipulation, for new activities. It is a common denominator for faculty and students and has been fitted reasonably well to cost procedures. Most management systems, including the WICHE programs, use the unit in at least part of the information structure.

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[57] Ibid, pp. 14-15.

Commitment to the unit requires an institution to define *all* its instructional activities in those terms in order to capture them. While this seems self-evident it runs at odds with a number of practices that are still quite acceptable at many universities. Doctoral students, for example, conducting dissertation research often avoid registration or sign up for minimum credits even though they make extensive use of both facilities and personnel. An institution's loss from such "leakage" in accounting for instructional load may be large if state funding or tuition charges are based upon credit hours. An institution committed to this unit must take as its first step the closing of gaps in the reporting methods.

d. Activity Units

To meet the increasing fuzziness of the credit hour, some colleges or departments have constructed their own units. What this usually involves is listing activities along with a weighting that relates the item to either time or effort. These are summed as work units or points and a normal faculty load is set in terms of points. A sample of one such system endowed with ten years of experience is shown in Appendix C.

e. Weighting

Once the units have been collected or reported, two other refinements are introduced. The first is a factor used to

distinguish the relative importance of each kind of activity. The second application involves the assignment of the reported and weighted units to a source of funds, thus a costing process. In practice this multi-step operation to determine the cost of instructional units is exceedingly complex because budgeting and expenditure seldom fit well with instructional patterns. Our concern here is not with costing but with the first stage, weighting.*

Class size is commonly applied either by the simple expedient of multiplying credit hours by the number enrolled to get "student credit hours" or by multipliers related to class size ranges e.g. 5-9 students x 1; 10-19 students x 2; 20-40 students x 3. There is good reason for finding class size, a most important characteristic at the small college and somewhat less important where large lectures, teaching assistants, and TV classes are the practice. A frequency distribution of class sizes does have separate importance from the budgetary view and is usually a part of state system reporting.

Attempts have also been made to assess the differing time or effort requirements that arise from teaching different subjects,

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*Rodney Felder, *Results of a Questionnaire on Faculty Work Load* (New York: Finch College, November 1968).

from teaching duplicate sections, from the method of presentation, and from the level of the material. While the studies are numerous, the outcomes offer few hard and fast rules for refining credit hour or class hour units into equitable, comparable, and stable measures of faculty endeavor.

The other common weighting, beyond class size, is the level of instruction; lower division, upper division, graduate I, graduate II are common typologies. Sometimes terminal programs are separately accounted for. There is a good deal of variation in the place of extension classes. A fairly general practice places all degree credit in the appropriate class of resident instruction and leaves nondegree credit instruction with a fractional weight.

The difficulties in applying all these measures are great, but not because of the technical complexity of the method. Within any institution weightings and units stand for very real interests, some of them vested over a long period. Increasingly the function of agencies like WICHE, SREB, or even state boards of control is to provide a very narrow range of choices among the endless combinations that might be used. It is safe to say that without such external pressure comparability among institutions is hard to achieve and, indeed, many institutions would find it impossible to resolve internal complexities.

f. Teaching Effectiveness

No body of professional opinion has yet suggested that teaching effectiveness should be related to funding. It is an aspect of faculty "output," however, and bears note here. Astin and Lee drew responses from more than 1100 institutions and found that department chairmen and deans made judgments of effectiveness in about 80 percent of the institutions. Effectiveness was evaluated on the bases of peer judgment and research by about 40 percent. The criteria are also confirmed in quite a few other studies: teaching 95 percent, personal attributes 56.8 percent, length of service 47.4 percent, research 46.6 percent.[58]

Since 1960 there has been a trend away from extensive student evaluation toward more emphasis upon peer groups. Student evaluations tend to show good reliability and freedom from obvious biases such as grades received. A summary of information is available in ERIC Report 10.[59] In the present climate of professional practice it is unlikely that judgments of teaching effectiveness will be formalized and quantified as a major measure of faculty output.

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[58]Alexander Astin and Calvin Lee, "Current Practices in the Evaluation and Training of College Teachers," *The Educational Record* 47 (Summer 1966): 361-375.

[59]Robert T. Blackburn, *The Professor's Role in a Changing Society*, Report 10 (Washington, D.C.: ERIC Clearinghouse on Higher Education, 1971).

2. Measures of Professional Activity

All along it has been acknowledged that the efforts of a faculty member extend beyond the instructional scene. As a functioning professional, he has a role in the administration of the institution, a part in his discipline and the world of knowledge it represents, and responsibilities toward other publics who are clients of the university. The idea was given substance by a phrase that appears in Father Henle's study, "the full professional life."[60] In attempting to portray a more accurate picture of what faculty, particularly university faculty, are engaged in, institutions have turned to the professoriate itself. The terms of inquiry differ but they have the single objective of reflecting all professional efforts. The academic man has two fundamental resources, his time and his intellect. Only time is easily quantified and standardized. "Effort" has been suggested as a term to describe the combination of time, intellect, and vigor. Since it was proposed by the Henle Study in 1967 the concept seems to have gained little acceptance and offers no clear advantages over time-distribution methods.[61]

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[60]National Science Foundation, "The Full Professional Life: Its Philosophy and Its Description Through Activity Concepts, Ch. 3, *Systems for Measuring and Reporting the Resources and Activities of Colleges and Universities*, NSF 67-15 (Washington, D.C.: National Science Foundation, 1967).

[61]Ibid, p. 21.

a. Total Hours Worked

A number of studies have simply asked faculty members to record how their time was spent. Others have suggested a set of categories and asked for the hours devoted to each. Results vary from about 45 hours per week to highs of 65 and in one case 84.1 hours![62] From diaries broken into ten minute intervals one investigator arrived at a median time of 58 hours, 25 minutes.[63]

By combining data from a number of studies Bowen and Douglass found fifty-five hours devoted to professional activity as a median. (See Appendix A.) While such data have quite limited utility, these studies do demonstrate that the scholarly professions devote about the same amount of time to their work as do the other professions. Actual time diaries have gone out of fashion as a research device, but occasionally the need for self-justification reappears.

b. Percentage Distribution of Professional Time

To control for individual variability and still capture a full range of activity, a number of institutions have

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[62]Elene Mitchell, "The Need for Time Analysis of Instruction," *Journal of Higher Education* 8 (June 1937): 311-314.

[63]W.W. Charters, "How Much Do Professors Work," *Journal of Higher Education* 8 (June 1942): 298-301.

experimented with faculty reports of the fractions or percentages of total time devoted to various responsibilities. This avoids inflated reporting and keeps touch with reality because it can be compared with scheduled class time, committee assignments, known research projects, and the distribution cited by other faculty. Faculty members themselves seem to prefer this method and it emerges from faculty committees quite often. Sample forms from Michigan and Wisconsin are contained in Appendix B.

c. Distribution of Work Week

A modification of the percentage scheme is found in the designation of a certain number of hours, say 48, as the symbolic work week. Each term faculty record the ways in which they distribute these hypothetical time units among their various activities. This scheme has the advantage of all abstractions, and the units can be manipulated by mathematical formulas without danger of collision with reality. The recent report of the University of Texas on a "Faculty Work Load Formula" fixed on the symbolic 40-hour week with a normal expectation that thirty-two units of time would normally go to "Teaching and Administration in support of the University" and the remaining 8 "hours" to research, consulting, editing, and similar responsibilities. A system of weightings for the various types of work -- 2.5 "hours" are allowed for each

semester hour of a regularly scheduled course, for example -- allows the formula to be used both as a reporting device and as means of specifying assignment of responsibility.

Stecklein notes that work load formulas have been "widely promulgated but not widely accepted."[64] It may be that acceptance was low when formulas were used only to aid administrative decisions about assignments. With the need at hand for a medium of exchange that will serve the reporting and communicating functions as well as the assignment function, the faculty work load formula may become more attractive. Linkage of work distribution to program budget categories is illustrated by the WICHE approach.

d. An Inventory of Achievement

One other means of reporting more fully the nature of a faculty member's work has been suggested by several authors but, it has not often developed to the level of utility. Rather than treat units of time, this device requires reporting non-teaching professional efforts in terms of payoff. Lazarsfeld and Thielens state "The achievement of a member of the academic profession can be judged on at least three grounds: his publications, the recognition he has received from his peers and from the

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[64] John Stecklein, *How to Measure Faculty Work Load* (Washington, D.C.: American Council on Education, 1960).

community, and his ability as a teacher." They set aside teaching but set up a scoring system ". . . to form a rough index of productivity. One score point was assigned for dissertation, another for publishing one or more papers, a third for publishing one or more books, and a final one for having delivered at least three papers at professional meetings." Although they were using the measures as a research device, many department chairmen have long used informal inventories of activities to rate their faculty members.[65]

Diana Crane studied the correlates of professional recognition and found them to be related to the prestige of one's academic affiliation rather than to productivity in terms of publication.[66] Studies of the relation between the quantity of publications and various measures of eminence give mixed results which vary among fields. Correlations range from .20 to .61.[67] Measures of the quality of publications are limited, but citations by others is a good index. Cole and Cole found a citation index well

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[65]Paul F. Lazarsfeld, Wagner Thielens, Jr., *The Academic Mind* (Glencoe, Illinois: Free Press, 1958).

[66]Diana Crane, "Scientists at Major and Minor Universities," *American Sociological Review* 32 (1967): 699-714.

[67]Richard Smith and Fred Fielder, *The Measurement of Scholarly Work in Academic Institutions* (Washington, D.C.: Office of Naval Research, February 1970).

related to a number of other factors including the department standing and the individual recognitions.[68]

There is no great consistency in the activities by which faculty can be evaluated. In part this is a function of the lack of agreement on methods for evaluation. Summary studies show a heavy dependence upon the individual judgment of presidents, deans, and department heads. Gustad found that classroom teaching, personal attributes, student advising, research, publication, committee work, professional society activity, length of service, supervision of graduate study, consultation, and competing offers held importance, in that order.[69] Activity lists have a high value for the department chairman where local conditions and policies shape the emphasis and faculty reports corroborate or deny it. Beyond that level they have only informal value.

C. INSTITUTIONAL INDICATORS OF PRODUCTIVITY

Complex though the matter of faculty work load and productivity may be, it is eclipsed today by the larger question:

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[68] S. Cole and J.R. Cole, "Scientific Output and Recognition," *American Sociological Review* 32 (1967): 377-390.

[69] John W. Gustad, *Policies and Practices in Faculty Evaluation* (Washington, D.C.: Committee on Teaching, American Council on Education, July 1961).

"What can be used to indicate the productivity for a whole institution?" The origins of such a question lie in several recent developments. First there is the matter of accountability to the public which requires justification, not only of faculty activity but of all the activities claimed or perceived as part of the university. Then there is the internal need for information that allows the top administrative team to sense the condition of a complex university organization. Finally, there is some need to have all those involved in the collective effort of an institution see the unity of the enterprise. Faculty and staff must sense their relationship not only to university purposes but also to institutional accomplishments. Institutional outputs divide into those related to instruction and those related to other functions, notably public service and research.

1. Instruction-Related Outcomes

a. Faculty to Student Ratio

Rooted in the Talmudic approval of twenty-five students for each teacher, the idea of some fixed student-faculty ratio has enjoyed the endorsement of both the sacred world and the profane. Self-evident in its significance, and with nearly universal applicability, it seems to be an ideal index. And it is true that the ratio of full-time equivalent faculty to full-time equivalent students does give a good rule of thumb. But

it gives no more than that, and the dangers of imputing meanings which are not there has become much greater in recent years. Changes in instructional technology, curricular organization, and the role of faculty as well as that of students have placed sharp limits on its utility. For undergraduate colleges devoted wholly to instruction it may have some value, but universities must devise ways of escaping from the irrational tyranny of the student-faculty ratio. Like so many of the measures we have listed, the ratio has its applications, and there is a line of studies running from Ruml's analysis to the very recent work of Bowen and Douglass that depend upon it.[70]

b. Degree Output

There has been a noticeable increase in measuring degree output as an indicator of institutional or system accomplishments. Because of relatively high rates of noncompletion, often averaging 35 percent in undergraduate programs and 40 percent in graduate studies, institutions have been reluctant to use degree output. Recent studies have tended to indicate, however, that attrition among graduate students may be due largely to noninstitutional

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[70] Beardsley Ruml and Donald H. Morrison, *Memo to a College Trustee: A Report on Financial and Structural Problems of the Liberal Arts College* (New York: McGraw-Hill Book Co., 1959).

factors and that rates of completion for undergraduates may be much higher when transfers are taken into account. Partial completion also has a value and can be easily quantified. Still, the relative value of the degree versus noncompletion has some of the characteristics of an all or none payoff. All the types of investment that go into the process -- opportunity costs for the student, subsidy costs for society, and professional service costs -- attain their maximum capital value only if the degree is achieved.

Blaug and Woodall used degree output in their study of productivity in Britain, noting: "In the present analysis we must perforce limit ourselves to what can be readily quantified and measured. In the case of higher education the end product is simply a degree." Their conclusion is familiar: ". . . the increase in inputs has been greater than the increase in output . . . productivity has steadily declined."[71]

Charles S. Benson has reported on a study in Columbia, South America, which uses a degree output model, weighting degrees for the amount of time each normally requires. The input was conceived as "student years" and the output as

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[71]Woodall and Blaug, "Productivity Trends," p. 495.

completed degrees. ". . . we determined that the excess of inputs over outputs amounted to 68, 185 student years. . . 26.7 percent of the total inputs."[72] He suggests this method for individual universities as an indicator of how well each is meeting societal demands. It is in graduate education that the notion finds its greatest strength. The very high costs of the Ph.D. to all participants makes this measure of productivity especially useful in analyzing graduate education. Even its strongest partisans have been embarrassed by the high rates of noncompletion in graduate schools in recent years.

A particularly interesting use of degree production is found in the studies of Breneman.[73] He notes that the degree represents an output of the university's certification function. "Efficiency" is defined as the degree of economy with which student's time is applied to the process of achieving a degree. The unit of investigation is the department. He found that departmental behavior was directed toward maximizing the quantity of resources

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[72]Charles S. Benson, "Educational Productivity in Economic Terms," in *Institutional Research and Academic Outcomes*, ed. Cameron Fincher (Athens, Georgia: Institute of Higher Education, Association for Institutional Research, 1968), p. 26.

[73]David W. Breneman, *The Ph.D. Function: The Case at Berkeley, Paper P-16; The Ph.D. Degree at Berkeley: Interviews, Placement and Recommendation, Paper P-17; An Economic Theory of Ph.D. Production: The Case at Berkeley Paper P-8* (Berkeley: University of California, Office of the Vice-President for Planning and Analysis, June 1970).

made available to it. The amount of resources allocated was determined by the number of students enrolled, not the number of degrees. Ergo, the resource allocation system was counter-productive to the efficiency of the certification process. This is much too simple a summary, but it illustrates the importance of degree output as an analytical tool.

A method of assessing doctoral output per equated full-time professor has been developed by George E. Hay. Using the department as the unit of analysis and tabulating the direction or codirection of a completed dissertation as the measures, one can gain a good impression of departmental performance. Five-year rolling averages are used to allow for perturbations in program design and faculty composition.[74]

c. Measures of the Learning Environment

The last twenty years have seen the accumulation of research concerned with the aspects of the academic environment as they relate to completion, the perceived quality of the academic experience, levels of stress, etc. The nature of this influence

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[74]George E. Hay, "Doctoral Productivity," mimeographed (Ann Arbor, Michigan: University of Michigan, Horace A. Rackham School of Graduate Studies, 1970).

is not completely known, but its general validity is clearly established.*

Forward looking institutions have begun to collect data on the attributes of the university environment, to study the effects on student performance, and to calculate the costs of experimental adjustment. Some of the components drawn from recent discussion guidelines used for a WICHE conference are:

Mean time to attain a degree

Faculty turnover

Faculty availability to students

Faculty stress

Academic resources inventory (library, tapes, etc.)

Academic mix of entering classes

Student stress[75]

2. Noninstructional Aspects of Institutional Output

It is in the nontraditional areas of university activity that the greatest problems of identification and measurement lie.

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*In fact some of the recent innovations such as cluster colleges and residential colleges are rooted in the idea that the environment is a critical factor in student learning.

[75]Lawrence, Weathersby, and Patterson, eds., *Outputs of Higher Education*, p. 112. See also Steven Withey, ed., *A Degree and What Else?*.

There is general agreement that the two principal aspects of university efforts beyond instruction are public service and research. A good case could be made for an additional category, administration, because university resources in increasing amounts go into executing and reporting activities in terms that are imposed by outside agencies. For example, a shift to new budgeting procedures or to quarterly reporting of research expenditures on research to NIH imposes certain administrative costs that are not part of the university's normal transactions. The lesson has been clear in the matter of research overhead and should not be ignored. As public involvement becomes greater, the university will "produce" more administrative activity to accomodate the needs of others. This activity deserves to be isolated and recorded.

In the case of research and public service we must recall that the need to describe these activities is so new that there is little agreement on classification. In the case of public service there is an absence of definition, while in the case of research there are so many descriptive attempts that they generate confusion.

a. Public Service

Public service, the distinctive American contribution to university purposes, probably has too brief a history for accurate

definition. There appear to be two ways of looking at it: the extended form of these services, and the narrow or intensive form. A definition of the broad form might be: "All activities intended as services to the community, the state, and the public of this and other courntries" or "all activities in which the individual's academic and professional competence is made available to the general public or to special groups."[76] This view might list consulting, service on government bodies, editing professional journals, participating in accreditation, and judging, along with involvement in nondegree instructional programs, agricultural extension, cultural activity, community TV and radio, museums and libraries, regulation and inspection services.

A much more restrictive view would permit only those activities which are peculiar to the university noting that "much accomodation of special interests has masqueraded as public interest." Brandle, a proponent of this view, offered the definition ". . . non-research benefits accruing to persons other than students and employees."[77] I would think this means intended benefits. Under this view faculty members would act as independent professionals in providing

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[76]National Science Foundation, *Systems for Measuring and Reporting the Resources and Activities of Colleges and Universities*, p. 85.

[77]John E. Brandl, "Public Service Outputs of Higher Education," p. 85.

expert services to the public, except when they were on specific assignment by the university. Two general classes of public benefits appear under this narrow definition:

1) Reimbursed: activities which are separately costed and for which charges are specified. Extension service including special training programs to business and government.

2) Nonreimbursed:

   (a) Radio, TV, and other cultural presentations

   (b) Clinics, hospitals, demonstration farms, and other units

   (c) Income transfers -- a most important public service that is assuming greater significance. The university, by its student aid programs, is expected to redress social and economic inequities which might hamper the educational development of academically adept and culturally disadvantaged students.

   (d) Development of critical diversity -- a public function of the university which is almost wholly beyond evaluation but is of the utmost importance. By encouraging an intellectual outlook, moral analysis, and social sensitivity the university

> creates a cultural diversity which is the engine of change in a democratic society. Too little prized and too often excused, this fostering of marginal groups of high competence is an essential feature of a society which understands and respects change.[78]

b. Research

While research has been a part of the university since the 1870s, its growth in the last three decades has placed the activity in an entirely different perspective. Academics find themselves in an uncomfortable position regarding research because, while acceptance and understanding is reasonably good inside the university, public comprehension of its implications has been retarded. One might even place a very blunt interpretation on the present situation: the basic problem of the academic world is to establish a public attitude of understanding and support for academic research. It must be done now, in the seventies, or institutions of higher learning will be pressed by

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[78]Donald Schon, *Beyond the Stable State* (London, England: Temple Smith, 1971) pp. 128-130. See also Kenneth Keniston and Mark Gerzon, "Human and Social Benefits in Higher Education," in *Universal Higher Education*, ed. American Council on Education (Washington, D.C., 1971), pp. 37-62.

restraints on resources into a narrow instructional role. The nature of the problem is made even more acute by the role that has attached to research activity in the reward system of the university and in the informal basis for evaluating eminence.[79]

Part of the problem is to make clear the breadth of the distinction between universities and colleges. At the same time the significance of research within the institution must be established more clearly. For example, in the absence of demonstrated relationships it cannot be assumed that research, ipso facto, contributes to instruction.

The WICHE approach to cost analysis recommends that "organized research activity should be identified as distinct programs." The simplest distinction separates sponsored research from all unsponsored forms, and the usual method of measurement is simply to total the value of contracts.

1) Sponsored research: includes all externally funded projects. The WICHE cost system distinguished these into two subclasses by location of activity:

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[79] E.T. Kohler, "A Survey of Faculty Work Load, Policies of Selected Universities," in *The Challenge and Response of Institutional Research*, ed. Cameron Fincher (Athens, Georgia: Institute for Higher Education, Association for Institutional Research, 1969). Among fifty-seven major institutions polled, selected faculty at thirty-eight cited research as a major factor for advancement.

(a) Institutes and research centers

(b) Individual and project research

A more common set of subtypes identifies the sponsor:

(a) Federal

(b) State and municipal

(c) Foundation

(d) Industry

(e) Individual and other

2) Unsponsored research: is research activity which draws upon university resources in some form. It is usually reported only in terms of released faculty time, and other costs are obscured. Many institutions have established the bulk of internally funded research on a project basis in order to fix more clearly the extent and duration of the activity. The panels for reviewing internal proposals are organized around major divisions of knowledge and conducted under the auspices of an all-university agency, the graduate school, the office of academic affairs, or the office of research. This kind of an intrauniversity research program increases accuracy in reporting and planning, with a net result that more funds are available for identifiable research activity. Having brought the major part of

internal research funds under university-wide control, the remainder can be left at the disposal of the colleges and departments. Because of the variation in the type of activities that can be related to inquiry, this latitude is desirable.

Few typologies of internal research have any great utility, and they rarely go beyond the list suggested by an NSF study.[80]

(a) Departmental research

(b) Faculty research projects

(c) Teaching-related research (usually experimental instructional programs)

(d) Creative activity in the arts -- a special class of research-type activity which is usually treated as an in-house project.

D. STUDENT RELATED OUTPUTS

The omission of student-related measurements is one of the strangest features about the search of ways to assess and compare production with resources to give an indication of productivity.

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[80]National Science Foundation, *Systems for Measuring and Reporting the Resources and Activities of Colleges and Universities.*

Admittedly the problems of assessment are large and the hazards of error perilous. Nevertheless, the effects of exposure to higher education have been explored sufficiently by the social sciences to provide good methods for estimating the outputs of a college education. We know that learning results in change, that this change has a cognitive aspect and an affective dimension, that part of the alteration is developmental in character and another part involves the individual's socialization to a variety of roles. We even know a great deal about the kinds of change that can be affected during the college years spent at most institutions. Keniston and Gerzon have summarized the main forms of change college graduates show.

1. Increasing openness: movement from dualism to multiplicity, toward liberalism and nonauthoritarian view, toward tolerance of ambiguity.
2. Commitment, but always within a relativistic framework: intellectual and ethical commitments are formed around personal analysis rather than stereotypical guidelines.
3. Identity formation: a "differentiation and integration of the ego," an elaboration of the concept of self, increased autonomy and the freeing of impulse.

4. Elaboration of occupational orientation with an examination of intrinsic features of career choice.[81]

David A. Brown renders a different approach to the issue of assessing the effects of college upon individuals. Rather than starting with what research has demonstrated, he begins with a statement of acknowledged educational goals and suggests that we match up the best measurement methods we have at our disposal, working all the while toward improving them. The goals related to individuals follow:

- Learn to feel
- Learn to retain facts
- Learn to think
- Learn to decide
- Learn to act
- Learn to learn
- Choose a career
- Gain admission to next stage in a career
- Develop skills in one's chosen profession
- Earn a living
- Fulfill society's manpower needs

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[81]Kenneth Keniston and Mark Gerzon, "Human Social Benefits," pp. 37-62. See also Stephen B. Withey, ed., *A Degree and What Else?*, particularly G. Gurin, "The Impact of the College Experience," pp. 25-54.

- Identify new phenomena
- Synthesize and summarize in new ways
- Communicate new knowledge
- Relate knowledge to societal problems
- Evaluate effectiveness of current attacks on problems[82]

It would be fatuous to suggest that measures of effects upon individuals can be immediately costed out to give indices of productivity. But these effects remain the heart of the process. It is changes in this process which promise to yield the greatest improvement in cost-benefits. As Virginia B. Smith pointed out, "Substantial increases in productivity will likely be achieved only through changes in the educational process itself. Certainly the significant advances in productivity in industry have involved the processes of production rather than the support functions."[83]

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[82]David G. Brown, "A Scheme for Measuring the Output of Higher Education," in *Outputs of Higher Education*, ed. Lawrence, Weathersby, and Patterson, pp. 31-34. See also Alexander Astin, "Measuring Student Outputs in Higher Education," in *Outputs of Higher Education*, pp. 27-40.

[83]Virginia B. Smith, "More for Less: A New Priority," in *Universal Higher Education*, ed. American Council on Education, p. 127.

In Summary

There is an elaborate variety of techniques for measuring faculty activity, fewer for assessing institutional performance, and only the merest beginning of developments of those related to students. These techniques lack consistency, but most of all they lack a systematic conceptual scheme for relating to each other. Some have exhausted their usefulness, e.g. student credit hours per full-time faculty member. Some are severely limited in their utility, e.g. inventory of faculty activity. Others are useful when put into a larger setting, e.g. cost of student credit hours in PPBS. Still others present the directions in which not only research but experimentation must go, e.g. components of student development.

III Some Alternate Models

A critical review of the output-input notion and the scattered techniques that have grown up around it has been developed. It would be an error to assume that the approach is without value; at least one major current study, Radner and Miller, is following the economic model.[84] Nevertheless, the deficiencies are

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[84]"Higher Education in the United States may be thought of as a giant 'industry' in which (1) the 'inputs' are students of various qualifications, the services of teachers, and all other usual kinds of material and service inputs and (2) the 'outputs' are graduates (and dropouts) of various qualification." Roy Radner and Leonard S. Miller, "Demand and Supply in U.S. Higher Education," *American Economic Review* (May 1970), Supplement, p. 327. This is the first unit in a six-part study.

clear. Goals of convenience are forced upon the user by the need for unitary measures. Fragmentary measures are allowed to stand as proxies for more complex attributes. The process itself is largely overlooked. The analysis must be made after the fact.

These deficiencies together with a rapid growth in new techniques for handling information, a new concern for planning, and new approaches to cost analysis have led to several quite different avenues for assessing university activity. One of these, the laissez faire view, is much older but deserves passing mention, two are representative of the most popular contemporary schemes, PPBS and CPM-PERT, and the third is a speculative anticipation which has grown out of experimental change models.

A. THE REPUBLIC OF SCHOLARS

In the early 1960s Michael Polanyi described the community of science as a system of autonomous individuals who make their decisions on their own about what they shall explore. These judgments are tempered, not by personal whim, but by their perception of larger needs and the directions of community interest.[85]

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[85]Michael Polanyi, "The Republic of Science," in *Criteria for Scientific Development, Public Policy, and National Goals*, ed. Edward Shils (Cambridge, Massachusetts: The M.I.T. Press, 1968), pp. 1-20.

Knowledge about the community is assured by an open network of publication and exchange. As a result, what appears to be merely a collection of disparate decisions is, in fact, a pattern of change directed by coordinated intelligence. This design has often been viewed as descriptive of a good university and is certainly the way in which the scientific community perceives itself. It is probably at the roots of much of the current criticism and is, of course, the very anthithesis of the "managed" or "administered" institution. Now out of vogue, it deserves recognition if not acceptance.

B. GOAL MODELS

These schemes, schemes of management as well as analysis, are the products of a new generation of technology; information system design, decision theory, cost-benefit concepts, organization theory, performance budgeting, etc. By their very design they eliminate some of the major shortcomings of the production model. The new models emphasize self-determination of the goals and a full statement of them, analysis of the process factors in advance rather than post facto, the integration of large amounts of information, a consideration of interrelatedness instead of forced separation into units, and attention to the points of choice and decision. These schemes focus on a program

or a project, rather than on an organization. There is one major assumption, that almost everything is known about the problem and the process. Above all they emphasize planning, planning with care, in great detail, and occasionally with boldness.

A differentiation established by Weathersby provides an aid to the remainder of this discussion. "We often confuse management with leadership to the detriment of both. Leadership is knowing where to go; management is knowing how to get there. Leadership is setting desirable objectives; management is discovering efficient methods of achieving these objectives. Leadership is charismatic, qualitative, idealistic; management is analytical, quantitative, pragmatic. Managerial tools are reproductive, exportable, and politically demonstrable while leadership is unique."[86]

1. Planning, Programming, and Budgeting Systems (PPBS)

This goal model has attracted attention in education at all levels, from K-12 through state-wide boards. It is being introduced over a wide range of organizations, and the process

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[86]George S. Weathersby, "PPBS: Purpose, Persuasion, Backbone and Spunk," *Liberal Education* 57, no 2 (May 1971): 211.

of initiation has been going on since about 1966. The very least that can be said about PPBS is that it is an ingenious method for concentrating common sense in an orderly fashion, but of course, it is a great deal more. PPBS has two faces. On the one hand it is an organizational technique whose elegance and symmetry generate enthusiasm in anyone who has tried to shepherd a complex organization to a clear decision. On the other hand, the process of introducing PPBS represents a political lever with great power.

A description of PPBS displays its virtues: "The heart of program budgeting is the grouping of activities by programs whose costs can be assessed and whose benefits to the institution can be identified."[87] Other elements of the process require that the organization:

(a) Designate goals and intermediate objectives leading to each goal

(b) Develop alternative plans for reaching the goal

(c) Estimate the resources required by each program alternative

(d) Assess the cost-benefits of each plan and of all plans in relation to each other

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[87]Robert J. Parden, "Planning, Programming and Budgeting Systems," *Liberal Education* 57, no. 2 (May 1971): 202.

(e) Compile the budget to support the selected plans

(f) Review, revise, or continue on the basis of performance.

The key feature of PPBS is its cyclical review, not only of how well the budget is met, but of performance in accomodating intermediate goals of a nonfinancial nature. Thus the consideration of productivity becomes an integral part of the evaluation stage as well as of the planning stage of PPBS (which presumably takes place at the levels which command the greatest knowledge about a subject).

Clearly PPBS is not a production model! It is a goal-setting process accompanied by planning to achieve selected goals and provide for regular review. The goals are decided apart from the budget, but not apart from financial matters, for costs are examined in advance. The budget becomes the servant of planning, not the determinant of it. What happens to production? Where is productivity? The answer is that the notion of production units is replaced by goals. Productivity is considered *in advance* as a part of the plan, so that it no longer has distinct meaning. There is no point in attempting to measure it after the fact if all its components have been reviewed beforehand.

PPBS has some limitations of its own, however. Two vestiges of the output-input model remain: the problem of defining goals, which is similar to the problem of identifying outputs, and the need to convert components into pecuniary form. Still other limitations are generated by the peculiar political leverage its introduction portends. In spite of the great emphasis upon participation in goal setting and program design, the fact is that responsibility for the ultimate decisions moves steadily upward until the key choices are focused at the top of the organization. Just how this kind of power concentration is going to work out in a collegial or associative organization is a most important question, especially when it touches areas like the classroom, where professional autonomy is claimed. The way in which PPBS is introduced is very much related to this implicit concentration of power. Ideally programs and goals are generated from the ground up, taking advantage of local wisdom at every step. The ultimate decision group, therefore, has at its disposal a maximum amount of information plus a great deal of power to choose from among the programs and the alternatives for achieving them. This is undoubtedly the intended design of PPBS. As noted above, however, this feature lends PPBS a second face. If program budgeting is imposed from above and forced downward upon an organization the concentration of decision-making power is still insured, but it exists without the benefit

of information developed at the lower levels. The fact that such imposition works havoc with the information and program development side of PPBS is of little moment if the purpose of introducing the system is to concentrate power. This is undoubtedly the reason so many new administrations, particularly at the state board level, become proponents of PPBS. It must be emphasized that the manner in which performance budgeting comes into being can become a means of altering the existing authority structure.

The scheme requires a total commitment and a very expensive set of operational supports, a management information system, elaborate financial reporting, extensive planning time, etc. As Robert Huff, the Director of Training Programs for WICHE observed, "Educational institutions could fall into the trap of technocracy in which economic analysts control decisions by virtue of the cost data and analysis they are willing or able to apply. The cost of PPBS may not be worth it."[88] The most striking inadequacy is that it requires or assumes a high degree of certainty about future conditions at the point of planning. Too many uncertainties collapse the plan or force wholesale

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[88]R.A. Huff, *Program Budgeting: Promises and Problems*, ED 040 672. (Washington, D.C.: Educational Resources Information Center).

reconstruction. In an age of rapid change this may be a fatal flaw.

One other observation must be made. PPBS was developed by and for the military system. It has not had conspicuous success there in the creation of weapons systems, in the refinement of strategic decisions, or in modifying any other aspect of government. All that can be said is that it *may* have prevented other actions that *might* have been worse. The goal of every military system is the absolute waste and destruction of physical goods. The benefits beyond these goals may be of a much higher order, the defense against even greater waste or against a threat to survival, but that is quite another aspect. This comment is intended to point up the fact that any system fitted to other premises must be adopted cautiously. The use of caution applies especially to education, which concerns itself with maximizing the development of the most elusive raw material of all -- human talent.

2. Critical Path Management and Program Evaluation Review Technique (CPM-PERT)

Two other network based management systems are Critical Path Management and Program Evaluation Review Technique. Like PPBS, these are constructed from a series of new methods of

gathering information, costing, and decision making.[89] Where PPBS emphasizes the planning process and the establishment of goals, these are "management" models, emphasizing the pathways to pre-established objectives. Their principal emphasis is on timing in such a precise form that wasted man-hours are virtually eliminated by carefully planned steps for production. Reflecting their origins in the construction and manufacturing industries, they provide for great precision in assessing alternate forms of scheduling. Key events or activities are laid out in alternate relationships so that decisions can be made in advance.

There is a slight advantage in the way in which CPM-PERT deal with uncertainty. As the decision "trees" are charted out, the hazards of chance can be introduced at the most likely locations and partially dealt with.

Again, these two schemes anticipate productivity by introducing it in the planning phase. They are most useful when the execution of a process, rather than the determination of goals, is the matter of greatest importance.

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[89] R.D. Archibald and R.L. Villoria, *Network Based Management Systems* (New York: John Wiley and Sons, 1967). An excellent summary of the components, Gantt Charts, network construction, decisions trees, etc. is included.

C. GENERAL SYSTEMS MODELS

The impossibility of predicting with any substantial accuracy the nature of future conditions or the consequences of present actions is partly a phenomenon of our time. Having developed planning to a high level, we find that it simply accelerates change. And change, rapid change, has led to the beginnings of still another approach to organizational planning. Several terms have appeared to describe this approach, "cybernetic systems," "learning systems," "change models," "open systems" to name a few.

Objectives are not established as discrete goals to which resources are committed. They are presented as a "range of possible future states." The process of forming them is not one of prediction from present conditions but one of "conjecture" in which information stimulates imagination. From these "futuribles" one decides which state is to be made most probable. Instead of programs we have directions, instead of assumed certainty, a degree of probability.

At this point the major difference between goal systems and these feedback models becomes clear. Instead of following a plan of stepwise components, calculated to reach the goal, only the first and most probable step is taken. Instead of including

only budgetary feedback, as with PPBS, the supporting information system is designed to report a whole set of key indicators about the state of the organization. Readings are taken then, not on the distance to and direction of the goal, but on the condition of an organizational system that has just been pointed in that direction. This refers, of course, to the analogy of Norbert Weiner's "steersman" who constantly corrects the ship (the system), cybernetics. If the course creates no serious "error reports" then the direction is continued. As a matter of fact, error is not only expected, it is the essence of operation. In the case where required adjustments are so severe that they threaten the system, other goals within the probable futures may be selected.[90]

Even from this brief description the essential points can be perceived. a) The method is not only sensitive to change, it uses change as the main component of operation. b) The point of concentration is the system as it is functioning *now* and the efficiency with which it operates in all its sectors, not just those related to the goal. c) When unexpected conditions arise, they are not threats to policy but opportunities for decision making.

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[90]This simplified statement draws heavily upon Raymond A. Bauer, *Social Indicators*; Donald Schon, *Beyond the Stable State;* and Raymond A. Bauer, "Societal Feedback," *The Annals* 373 (September 1967).

The method, of course, requires a comprehensive, rapid feedback, information system. This kind of change-oriented model may be conceived as one in which the cycles of PPBS -- goal setting, program alternatives, decision making, budgeting, review -- are speeded up to the point where a continuous process has been generated. It is not hard to anticipate the next step. Speed up the process further until it simulates the state of the future that lies just ahead.

All of this is far from workable, acceptable operational form, even though it is under widespread experimentation. It is even further from university application. Why is it mentioned here? Because, it represents the alternate in the assessment of productivity, the application of resources with an instantaneous report of output.

D. SUMMARY

The first section of this paper developed a detailed review of the output-input model with its emphasis on production, fiduciary accounting, and after-the-fact analysis. This was followed by a much briefer review of several alternate models with an emphasis on the planning orientation of PPBS, CPM, PERT, and open systems thinking.

Because of the unfavorable light in which the output-input model appears in this review, a note of reality must be added to keep events in perspective. First, although the merits of the planning mode are clear in a theoretical analysis, the practical system is still a long way from full operation. Even PPBS, which is widely acclaimed -- and proclaimed too -- must undergo major redevelopment if it is to serve the root needs of education. The tighter managerial controls of CPM and PERT are even less suitable to a collegial, experimental environment. The task of formulating an acceptable system is underway. The WICHE project to develop a full-scale planning and management system is well on its way, but evaluation is still to be made.

Second, it must be noted that educational institutions, as they try to move from the older forms to a planning model, are undertaking a quantum jump. They are attempting a transition that required many years of steady evolution for business and industry. The direction of movement is clear, however, and a planning orientation holds the greatest promise for rational guidance of institutions of higher learning.

IV. Some Conclusions About Productivity

A. A MAJOR CONCLUSION

The development of future-oriented, comprehensive planning systems complete with provisions for performance monitoring has outmoded the concept of productivity in its usual form. The analysis of output after the fact and in terms of a single or few indicators no longer has general utility.

1. The planning mode and performance review cover many more phases of institutional activity than any output-input ratio. The elaboration of the university's mission from a single function, instruction, into several functions, research and public service, requires a comprehensive reporting and analysis scheme that is beyond the scope of the production model.

2. The shift into a planning mode includes all the factors measured individually by output-input ratios, but it considers them in relation to other program components rather than in isolation.

3. By aligning and relating the input resources before the events occur and relating them to benefits, the planning orientation encourages the development of alternatives and emphasizes decisions that shape the future rather than repair the past. Decision making is aided, not simply reviewed.

4. Because of the impact of PPBS and similar schemes upon the decision-making process, concentrating it upward, there are major advantages for the university that moves voluntarily into the planning mode. An important advantage attaches to this initiative in that the institution can define and specify its own program categories on the basis of its own interests rather than those of some external authority.

5. By concentrating in advance on the selection of complete programs designed to meet institutional goals, the planning models increase accountability. Institutional performance can be assessed in terms of progress toward self-determined goals rather than in terms of artificial productivity ratios.

B. MINOR CONCLUSIONS AND SOME PROBLEMS OF DEFINITION

1. The Persistence of Productivity

Although the concept of productivity in terms of output-input ratios may no longer be acceptable as an indication of institutional performance, it will still be widely used.

a. Because the simplified indices such as student-faculty ratio have had such extensive usage they will continue to appear. The only recourse for higher education is to explain their limitations whenever they appear.

b. There is also a great deal of utility in the productivity ratios so long as they are confined to the purposes for which they were developed, internal analysis.

c. Because of the large number of measures already available and the ease with which new ones can be invented, it is important that an institution proposing to use these indices standardize its reporting around units that are common to all divisions. It is also useful to choose measures that are used by other institutions. Some of the more common units are:

1) For instruction and related activity, credit hours have demonstrated the greatest utility. However, all types of instructional effort including independent study and advising must be defined in fractions or multiples of the unit.

2) Faculty effort is best reflected by self-reported distribution of time in terms of percentage. This method allows flexibility and variation at the department level but insures that aggregated information has a common base.

3) Institutional effectiveness can be reflected best by degree output, with appropriate weightings based upon the length of time involved in the "normal" program.

All of these measures can be related to resources in ways that yield approximate cost ratios.

2. Public Service Activity

The assessment of performance in the area of public service is made difficult, as we have noted, by a lack of fundamental definitions. Direct activity that is concentrated in discrete, specialized units, extension work for example, can be evaluated in terms of cost-benefits. But much of public service is highly elusive. Faculty service to the community may be reported in terms of time devoted to it. As we move into the social functions performed in terms of income redistribution represented by student aid, remedial programs, and extensive counseling the designations are more difficult. One can only conclude that the university role in public service needs much more scrutiny and analysis before its costs and values can be assessed.

3. Research

The true outputs of academic research are ineffable and not expressed by simple indicators. However, the idea that research is an investment in the knowledge of tomorrow as well as the technology of today is widely recognized in public circles. For this reason strict measure of output is not expected. But it is expected that resource allocations will be grouped around identifiable tasks or lines of inquiry. The refinement of the project system as the form in which public funds go to scientific endeavor is widely understood and generally favored over open-ended support.

Within the university, research activity divides into two large and very general categories, sponsored and unsponsored. Since the sponsored work has tended to develop into project form, it is rather easy to identify and review. The unsponsored research activity is quite a different matter. Much of this type of work is performed in institutes and centers where a fixed level of support is required for maintenance and "seed money," but an amorphous segment cannot be identified. Therefore, the first step in assessing the full range of research effort is to put this unspecified inquiry into identifiable form. One approach that is quite consistent with academic research traditions is to form all research into projects or programs with identifiable parameters and definite time spans. Even further, it

is possible to fund not just some, but the bulk of in-house research on a faculty research program which spans the whole university. Generally both project research and faculty fellowships are included in such a plan, but it may even extend subventions for publications or commissions for works of art. This kind of change may leave the productivity question unanswered, but it does align resources and efforts in an identifiable form.

4. Measures of the Effects of the College Experience

Measuring the effect of college exposure on individual students is an area in which theoretical research can be turned to practical application. Outcomes in terms of cognitive, attitudinal, social, and vocational change have been tested experimentally by a variety of studies. The general public recognizes the importance of personal development in education and would accept data on the subject with understanding. As a part of self-knowledge, institutions should begin gathering this data. Techniques of assessment are well standardized in many areas and ready for extensive application. The Graduate Record Examination series and numerous other subject matter tests offer means of assessing the level of knowledge in specific areas. Self-inventories and attitude scales are available for large-scale administration to test the dimensions of student change, that is to say, the direct outputs of education.

5. Cautionary Findings

The task of communicating the full scope of a university's mission and activity to all of its publics is a difficult one. It has become more difficult as the distance between society and the campus narrows. At the same time, public comprehension of higher education is a prerequisite for public support. Several guidelines suggest themselves:

a. Universities are badly represented by almost all simplified general formulas that are heavily weighted toward instruction. Every effort should be made to avoid reporting in terms that understate university functions.

b. University operations and those of undergraduate collegiate institutions are qualitatively different. Efforts should be made to separate the major classes of institutions whenever reporting of outputs is required.

c. All public reporting of university performance should be prepared in a variety of forms and directed to particular segments of the public in terms as close to their interests as possible.

C. PRODUCTIVITY AND PRODUCTION

1. An Instrumental View of Productivity

Throughout these pages the idea of productivity has been viewed as a mechanism for understanding the relationship between resources, inputs, and outcomes, outputs. In the past few years the word "productivity" has been adopted for uses that are remote from its specific meaning. Often the term seems to represent an instrument of control or coercion. Somehow the notion exists that mere insistence on something called "increased productivity" will work economic wonders in university operations.

The essence of the matter is which part of the equation is manipulated to achieve increase. Are resources cut or are measureable outputs increased? At Mankato State College the students recently demonstrated the fallacy of "increased productivity" by adding trivial courses to their schedules (more credit hours) to forestall an appropriation cut based on simple credit hour ratios.

The university in its own reporting and operations will serve its public interests best by countering misuses of "productivity" with full explanations of its functions.

2. Production

It is important to note that colleges and universities have long been concerned with production even though they have not had to be sensitive to productivity until recently. Production has meant the preparation of well-trained men and women whose competence is certified by a degree.

In response to the vigorous demands of the postwar era, an age of science, technology, and new management patterns, the colleges and universities focused upon training people in large numbers. "Production" had to be expanded. The initial task was one of marshalling facilities and faculties, the inputs, sufficient to meet the demand. Because of certain low utilization levels established during the war years and low faculty salaries, costs were not a serious concern.

A little later attention shifted to the high rates of non-completion in certain programs. It was noted that the number who received degrees was often sharply below those selected for admission. Attrition levels were as high as 60 percent in some doctoral programs and 40 percent in many undergraduate programs. With the introduction of new fellowship, scholarship, and loan programs, along with more effective counseling, this condition was met and "production" improved again.

As the numbers of trained persons increased the emphasis shifted to improving the quality of advanced education. "Excellence" became the watchword. Programs were improved by the addition of better facilities and more highly trained faculty. "Production" at this stage increased again but this time in a quantitative sense.

Higher education needs to remind itself occasionally that it has performed well on production, generating substantial social benefits. Because the need for more trained persons, better prepared graduates, and more diverse options for young people was a primary need, the costs in monetary terms were accepted by society.

The shift to an emphasis on the costs side of the costs-benefits equation has been sudden. There is good reason for optimism, however, based upon past performance. Once the issues are carefully analyzed, the colleges and universities may well be able to display the same success with the productivity problem that they demonstrated with the issues of production.

Table 3-1

ALLOCATION OF AVERAGE WORKWEEK
CLAREMONT COLLEGES FACULTIES[1]
(in numbers of hours)

Disciplines	Average Workweek	Average hours for Instruction	Average hours in Research Activities	Average hours in Administrative Activities	Average hours of Public Service	Percent of Workweek for Instruction
Natural Sciences	56.9	37.9	11.2	7.0	.8	66.6%
Mathematics and Engineering	53.8	34.0	11.3	4.5	4.0	63.2
Social Sciences	54.6	33.7	13.2	6.4	1.3	61.7
Language and Literature	52.1	39.0	8.2	4.2	.7	74.9
Fine Arts	54.5	33.3	15.4	4.5	1.3	61.1
Other Humanities	56.9	40.6	9.2	5.4	1.7	71.4
All Disciplines	54.8	36.4	11.4	5.3	1.6	66.4

[1]Excluding full-time Graduate Faculty

From: Bowen and Douglass
Efficiency in Liberal Arts Colleges

APPENDIX B

Faculty Activity Reports

Three forms show successive stages in bringing faculty activity into a relationship with funding. Each also has some distinctive feature of its own.

The University of Michigan "Academic Personnel Activities Report" illustrates how departments or colleges may introduce required sub categories to obtain locally important information. The main categories remain unimpaired and are collected across the university to give a summary picture. Note that no allocation of resources to these activities is reported.

The University of Wisconsin "Scholarly Activities Report" is clearly the product of a centralized office which can tabulate the data and report back to departments and deans. It displays the relationship between faculty time and the source of funds (Section II) in its simplified form.

The WICHE form, "Faculty Activity and Output Survey," carries the process of relating resources to activity. In this case resources are subdivided into programs and activities "charged" against them. Percentages are applied to the faculty member's salary to give the distribution of dollars among programs.

FORM B

THE UNIVERSITY OF MICHIGAN
ACADEMIC PERSONNEL ACTIVITIES REPORT

OIR COPY

NAME	SOC. SEC. NO.	TERM
[	- - -	FALL, 1971

DEPARTMENT OR AREA	SCHOOL OR COLLEGE	OFFICE(S) - ROOM & BLDG.
	NATURAL RES.	

IMPORTANT: PLEASE READ ACCOMPANYING INSTRUCTIONS BEFORE WRITING.

RECORD PROFESSIONAL ACTIVITY IN AVERAGE HOURS PER WEEK OR IN PERCENT OF EFFORT, BUT NOT BOTH: IF PERCENT, TOTAL TO 100.

( )HRS
( ) %

I. INSTRUCTIONAL ACTIVITY -- CREDIT INSTRUCTION

DIVISION NAME	DIV. NO.	COURSE NAME	COURSE NO.	CLASS NO.	I.D. NO.	CLASS TYPE	CONTACT HOURS	ENROLLMENT			

II. INSTRUCTIONAL ACTIVITY -- OTHER THAN CREDIT INSTRUCTION

1. FRESHMEN & SOPHOMORES - NATURAL RESOURCES
2. JUNIORS & SENIORS - NATURAL RESOURCES
3. MASTERS LEVEL STUDENTS - NATURAL RESOURCES
4. PH.D. STUDENTS - NATURAL RESOURCES
5. OTHER STUDENTS - INCLUDING THOSE FROM OTHER SCHOOLS & COLLEGES
6. OTHER INSTRUCTIONAL ACTIVITY

III. RESEARCH AND CREATIVE ACTIVITY

1. SEPARATELY BUDGETED
2. DEPARTMENTAL

IV. SERVICE ACTIVITY

(PLEASE LIST)

V. ADMINISTRATIVE ACTIVITY

1. DEPARTMENTAL
2. OTHER (PLEASE LIST)

VI. PROFESSIONAL DEVELOPMENT (KEEPING UP WITH THE FIELD)

DO NOT USE THIS SPACE

105

TOTAL

UNIVERSITY OF WISCONSIN
SCHOLARLY ACTIVITIES REPORT

Please make any corrections needed in preprinted materials:

SECTION I – IDENTIFICATION

1. (Name)
2. (Rank)
3. (SS No)
4. (Appt.)

SECTION II – TIME ALLOCATION PER BUDGET

1. % of full time	2. Fund/Act.	3. UDDS	4. Department

SECTION III – INSTRUCTION

SECTION III A – INSTRUCTION FOR COURSE CREDIT

	Campus	Department-Course No.	Type	Sec. No.	Student Enrollment	% of University Time
1.	⌊⌋	⌊⌋⌊⌋–⌊⌋⌊⌋	⌊⌋	⌊⌋⌊⌋	⌊⌋⌊⌋	⌊⌋⌊⌋ %
2.	⌊⌋	⌊⌋⌊⌋–⌊⌋⌊⌋	⌊⌋	⌊⌋⌊⌋	⌊⌋⌊⌋	⌊⌋⌊⌋ %
3.	⌊⌋	⌊⌋⌊⌋–⌊⌋⌊⌋	⌊⌋	⌊⌋⌊⌋	⌊⌋⌊⌋	⌊⌋⌊⌋ %
4.	⌊⌋	⌊⌋⌊⌋–⌊⌋⌊⌋	⌊⌋	⌊⌋⌊⌋	⌊⌋⌊⌋	⌊⌋⌊⌋ %
5.	⌊⌋	⌊⌋⌊⌋–⌊⌋⌊⌋	⌊⌋	⌊⌋⌊⌋	⌊⌋⌊⌋	⌊⌋⌊⌋ %
6.	⌊⌋	⌊⌋⌊⌋–⌊⌋⌊⌋	⌊⌋	⌊⌋⌊⌋	⌊⌋⌊⌋	⌊⌋⌊⌋ %
7.	⌊⌋	⌊⌋⌊⌋–⌊⌋⌊⌋	⌊⌋	⌊⌋⌊⌋	⌊⌋⌊⌋	⌊⌋⌊⌋ %
8.	⌊⌋	⌊⌋⌊⌋–⌊⌋⌊⌋	⌊⌋	⌊⌋⌊⌋	⌊⌋⌊⌋	⌊⌋⌊⌋ %

1. Indicate names of graduate students engaged in research whom you serve as major professor. List the degree for which they are candidates, and estimate % of time spent in supervision of these students. Do not include in the % time allocation in this section any time spent with students listed below which was claimed in III A.

Name	Degree Sought	Name	Degree Sought	% of University Time
				3 01 ⌊__⌋ %

2. Percent of time devoted to supervision or help of other students (not reported above). 02 ⌊__⌋ %

SECTION IIIC – POST DOCTORAL FELLOWS, INTERN AND HOSPITAL RESIDENT SUPERVISION ACTIVITIES

Indicate names of those whom you serve as a major advisor and estimate % of full time spent in supervision of these students (unless such time is covered in III-A or III-B). 03 ⌊__⌋ %

SECTION IIID – OTHER INSTRUCTIONAL ACTIVITIES

What percent of University time do you spend in

1. Short course instruction? 04 ⌊__⌋ %
2. Student advising (not reported elsewhere)? 05 ⌊__⌋ %
3. Preparation of new programs? 06 ⌊__⌋ %
4. Other? 07 ⌊__⌋ %

SECTION IV – NON INSTRUCTIONAL TIME ALLOCATION

What percent of University time do you spend in

1. Funded research activities? 08 ⌊__⌋ %
2. Departmental research activities? 09 ⌊__⌋ %
3. Administrative activities? 10 ⌊__⌋ %
4. Public Service or Extension activities? 11 ⌊__⌋ %
5. Other? 12 ⌊__⌋ %

TOTAL ---------- 100 %

FIGURE 3

FACULTY ACTIVITY AND OUTPUT SURVEY FORM

Name: Gordon Wingate Department: German

Number: 525-48-8819 Rank: Professor

	(1) Activity	Course Number	Department	Section	Contact Hours Lec	Disc	Lab	(2) Percentage of Time Devoted to Activities	Distribution of Percentage to Programs (3) 1.0 Instruction Program	(4) 2.0 Organized Research Program	(5) 3.0 Public Service Program	(6) 4.0 Academic Support Program	(7) 5.0 Student Service Program	(8) 6.0 Institutional Support Program	(9) 7.0 Independent Operations Program	(10) (11) Joint Effects: Programs	Percentage
A. Teaching Activities	A.1 Formally Scheduled Teaching Activities																
		182	210	04	4			14%	14%								
		343	210	01	3			12%	12%								
		699	210	01	2			15%	10%	5%							
	A.2 Contact Related Activities																
		182	210	04	4			10%	10%								
		343	210	01	3			8%	8%								
	A.3 Planning, Innovating, and Programming Activities																
	A.4 Informal Unscheduled Teaching Activities																
B. General Faculty Service Activities	B.1 Student Oriented Service Activities German Club							10%					10%				
	B.2 Colleague Oriented Service Activities																
	B.3 Institution Oriented Service (Professional) Activities																
	B.4 Institution Oriented Service (Miscellaneous) Activities																
C. Administrative Activities	C.1 Deparment Administrative Activities Asst. Chairman							8%				8%					
	C.2 College Administrative Activities																
	C.3 Institution Administrative Activities																
D. Committee Activities	D.1 Department Committee Activities																
	D.2 College Committee Activities																
	D.3 Institution Committee Activities Campus Planning							4%						4%			
E. Research, Scholarship, and Creative Works Activities	E.1 Separately Budgeted Research & Creative Work Project Activities																
	Project No. 168492							19%		19%							
	Project No.																
	Project No.																
	E.2 Not Separately Budgeted Research & Creative Work Project Activities																
	E.3 General Research, Scholarship & Creative Work Activities																
F. Extra Institutional Service Activities	F.1 Public Service Activities																
	F.2 Private Consulting Activities																
	TOTAL							100%	54%	24%		8%	10%	4%			

159 Estimated Total Hours Spent in Above Activities for the Week of (_____) 57

114

APPENDIX C

Faculty Activity Formula

This scheme for converting a variety of activities into a common form, "units," has been used by the Psychology Department at the University of Michigan for nine years. There are several distinctive features. Large courses are converted into units based upon the number of graduate assistants involved. Administrative duties are carefully subdivided. Field work is included to cover a wide range of activity.

Particularly interesting is the valuation of research at three units or 25 percent of normal load. The usual time allowed for research in these formulas seems to run between 20 and 25 percent.

University of Michigan

Department of Psychology 4/69

Rough Guide for Computing Staff Work Load

A unit is defined as scholarly or professional activity typically requiring one-half day (i.e., 3-4 clock hours) per week throughout the semester.

FULL-TIME = 12 Units

Formal Teaching	Number of Units
Regular course	1 unit per credit
New course (other than seminar)	1-1/4 to 1-1/2 units per credit
Large course (over 100 students)	Varies, depending on use of TF's and TA's
Laboratory section	1-1 1/2 times the number of cred. hrs.
Seminar	1/2 times the number of credit hrs.
(Seminars arranged in connection with a research project or as a special interest of the staff member should be included under research)	
Special lectures in shared courses	1/2 unit for each 10 hours of lect.

Informal Teaching	
Directing theses (Doctoral or Honors)	1/2 unit per active student
Directing other individual Research	Variable - estimate
Membership - doctoral committee	1/8 unit for each committee
Supervision of field work	1 unit per 1/2 day/semester

Administrative Duties	
Chairman of department	8 units
Chairman of Undergraduate Committee and Chairman of Graduate Committee	6 units
Chairman, other committees	(Estimate, using average number of
Membership, other committees	hours/week/semester)
Coordinator - Graduate Area Programs	1-3 units, depending on size/complexity
Coordinatory: Introductory Psychology	1-3 units, depending on size/complexity
Concentration Advisor	1 unit
Coordinator of Experimental subject pool	1/2 unit
Coordinator of extension teaching	1/2 unit
Library	1/2 unit
Graduate Advisor	1/2 unit per 6 students
Staff meetings and Colloquia	1/2 unit

Research and Scholarly Activities	1 unit/half-day/week(up to 3 units)
The department encourages staff members to charge this and research supervision to their research project.	
Professional Activities	
Community, State, National	1 unit/half-day/week

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